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CERTIFICATION OF GRASS AND CLOVER SEEDS.

SYSTEM ESTABLISHED BY THE DEPARTMENT OF AGRICULTURE.

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IN the *Journal* for July, 1929, was published an article entitled "Strain Investigation relative to Grasses and Clovers," by E. B. Levy and W. Davies, of the Plant Research Station. The article deals specially with the commercial perennial rye-grass seed as sold in the New Zealand markets at the present time, and sums up the results of research undertaken in connection with the various strains existing in this country. The writers claim that "what concerns New Zealand most at the moment are grass and clover types suitable for true permanent pasture"; and they bring forward data which show conclusively that "the Italian or annual type of rye-grass is markedly in evidence in commercial lines of perennial rye at present being harvested in New Zealand and offered for sale under the name 'perennial rye-grass' or simply 'rye-grass.'" As a result of their strain investigations they state that "New Zealand is extremely fortunate in that she has at hand a good perennial rye-grass type, probably equal to any commercial strain throughout the world—the Hawke's Bay type. Not that all seed from this source is genuine perennial; but at comparatively small expense the genuine crops may be identified, and, with these as a nucleus, mother seed can be produced; and this once grown will soon furnish a sufficiency of the genuine article for all New Zealand requirements at least."

These facts have such an important direct bearing upon our grasslands that the Department has decided to inaugurate in the current 1929–30 season the certification of true perennial rye-grass of the type that is now grown in the Hawke's Bay, Poverty Bay, and Sandon districts. A commencement will also be made with white clover and brown-top grass.

The present article outlines the organization set up to deal with the certification of grass and clover seeds. In a general way the objective is to establish an organization which will ensure the accurate distribution of grass and clover seeds of superior strain,

and to stimulate in every possible way the wider use and greater production of these seeds. It is hoped, with the co-operation of growers and merchants, to foster the export trade in these seeds by correct categorization of all exported lines.

THE SYSTEM IN BRIEF.

Following are the main points of the newly established system :—

(1) The paddock is recognized as the unit. Upon application the farm is inspected, and a plan drawn showing the exact location of each paddock or unit.

(2) Evidence is collected regarding such matters as age, origin of seed, &c.

(3) The determination of strain is effected by sample trials, grown at the Plant Research Station, Palmerston North, and checked up by a field inspection during flowering.

(4) Each grower is registered. He is given a number, and each paddock on his farm a letter.

(5) During or after threshing the sacks are branded and sealed in the paddock. They are tagged and again sealed after the seed has been machine-dressed, and a sample of the seed is taken, upon which is issued a purity and germination certificate.

(6) Records are kept of each line of seed, and returns of sales are made by merchants and growers to enable the seed to be followed up with a view to further certification.

CLASSIFICATION.

There are to be recognized three classes of certified perennial ryegrass, as follows :—

(1) N.Z. Perennial Rye.
Certified Mother Seed.
(Blue tag.)

(2) N.Z. Perennial Rye.
Certified Permanent Pasture Seed.
(Red tag.)

(3) N.Z. Perennial Rye.
Certified First Harvest.
(White tag.)

One class of white clover, namely,—

N.Z. White Clover.
Certified Old Pasture.

One class of brown-top—

N.Z. Brown-top (*Agrostis tenuis*).
Certified free from Red-top (*Agrostis palustris*).

Other crops will be introduced as material and information become available, as, for example, Montgomery red clover, Kentish wild white clover, Akaroa cocksfoot, and crested dogstail.

As already stated, the paddock is considered the unit in certification of grass and clover seeds. The certificate will apply to the pasture and the produce therefrom, and once this is ploughed up or resown registration lapses.

Age is computed as the number of possible harvest seasons through which an area has passed, irrespective of whether it has been harvested for seed each year. For example, in the case of perennial rye, seed sown from January to June, 1929 (autumn-sown), produces first-harvest maiden seed in January, 1930, one-year seed in January, 1931, and two-year seed in January, 1932. Seed sown from July to December (spring-sown) is not likely to be harvested for seed in January, 1930, but should this occur the produce therefrom would be first-harvest maiden seed. Generally a spring-sown crop will miss producing a maiden-seed crop, and the first seed harvested from such an area would be "first harvest one-year seed" in January, 1931; two-year seed in January, 1932; and three-year in January, 1933.

Perennial Rye-grass.

To qualify as a *Perennial Rye Mother-seed Area*—

(1) A sample of seed harvested from that area must have been grown at the Plant Research Station, and have been found sufficiently true to type to warrant it being registered for the production of mother seed.

(2) The seed therefrom must be four-year seed or older.

(3) The crop must be subject to a field inspection undertaken while in ear.

To qualify as a *Perennial Rye First-harvest Seed Area*—

(1) Evidence must be forthcoming that the area has been sown down with certified mother seed.

(2) It must be subject to a field inspection undertaken while in ear.

First-harvest seed is the first seed-crop harvested from an area, irrespective of whether it is one-, two-, or three-year-old seed. It is possible to have first-harvest maiden seed (which will be the most usual) or first-harvest one-year seed if the maiden seed is not harvested; or first-harvest two-year seed if neither the maiden nor the one-year seed has been harvested. Similarly, it is possible to have first-harvest three-year seed. Should four-year seed be the first seed harvested it would be accepted as permanent pasture under clause A (3) and B (see reference to permanent pasture below).

Merchants and growers who have purchased seed prior to the inauguration of this system, and with the object of sowing down for seed-production, must submit a sample with full details as to source of origin. These samples will be placed under trial, and a report furnished in about four to five months. If the trial report is satisfactory and the seed can be traced as four-year seed or older, it will be deemed to be equivalent to having been harvested from a mother-seed area, and the paddock from which it originated will be registered as a mother-seed area. Failing this the merchant or grower will miss one season, during which his first-harvest seed is under trial. This indirect means of registering an area, while not desirable, is necessary in the initial stages of certification so as to give equal rights to all.

To qualify as a *Perennial Rye Permanent-pasture Seed Area*—

A (1) A sample of seed harvested from that area must have been grown at the Plant Research Station and have been

found sufficiently true to type to warrant the area being registered for the production of permanent-pasture seed; or

(2) Evidence must be forthcoming that the area was sown down with mother seed, and a satisfactory sample trial report furnished upon the first-harvest seed from that area; or

(3) Evidence must be forthcoming that the type of rye-grass is correct, and that the seed therefrom is four-year seed or older. (This is designed to admit, during the initial stages of certification, old pasture in regard to which there is no sample trial report available).

B. In all cases the crop must be subject to a field inspection undertaken while in ear.

SPECIAL CONCESSION DURING INITIAL STAGES OF CERTIFICATION.

Very few, if any, sample trial reports are available bearing upon the 1929–30 harvest, and it follows that few, if any, mother-seed areas will be registered. Rather than pass one or two mother-seed areas which, purely by chance, have been reported upon, it has been deemed more fair to certify only to permanent-pasture seed areas, with the exception of the possible few lots of first-harvest seed previously referred to.

During the 1929–30 season, therefore, all pastures (with the exception of first-harvest seed referred to above) registered as fit to produce certified seed will qualify as permanent pasture areas under A (3) and B above—that is, they are of the correct type and are producing four-year seed or older.

It will be realized that probably most of the paddocks to be accepted under this scheme will in reality be fit for the production of mother seed, and, with a view to stimulating seed-production and the sowing of this seed in the South and elsewhere without delay, the following means of ensuring a supply of mother seed have been devised:—

(1) Except for first-harvest seed referred to above, such seed as is accepted will be certified to as permanent-pasture. It should be bought and sold as such.

(2) A sample of each certified line will be sown at once on the Plant Research Station and reported upon. If sown in March the report will be ready in July—that is, before seed is usually sown in the South Island.

(3) In cases where the report indicates that the seed is equal to the standard of mother seed, the parties concerned will be notified, the seed recorded as mother seed, and the first harvest progeny of that seed will be eligible for certification.

(4) If the seed proves on trial not to be up to the standard of mother seed it will have to be considered still as permanent-pasture seed. Every endeavour will be made to avoid such cases, and the standard will be made high with this object. However, a small percentage is likely to get in, and allowance must be made in this connection.

RESOWING OF PERMANENT-PASTURE AND FIRST-HARVEST SEED.

A grower who sows down permanent-pasture or first-harvest seed cannot have the first-harvest seed produced off that area certified.

If, however, some of the first-harvest seed produced off that area is sent for trial, and the sample trial report is satisfactory, the second and subsequent harvests may be accepted as permanent-pasture seed, and eventually as mother seed.

The main difference, therefore, between the grower who sows down mother seed as compared with one who sows down permanent-pasture and first-harvest seed is that the first-mentioned is almost certain to have his first-harvest seed certified (and this is the most profitable seed crop), whereas the sower of first-harvest or permanent-pasture seed cannot have his first-harvest seed crop certified under any condition whatever.

Moreover, a grower who sows mother seed is more likely to have his second and subsequent harvests certified. It is considered desirable that growers who wish to grow certified seed should obtain mother seed for this purpose, but to make such a proviso would eliminate some quite good seed crops, which is not at all desirable.

White Clover.

White clover areas may be registered as fit for the production of "N.Z. White Clover Certified Old Pasture" if the seed (1) is grown in New Zealand, (2) is four-year seed or older.

White clover seed dressed out of rye-grass seed is eligible for certification if the pasture conforms to the conditions set down as to age.

Brown-top.

Brown-top areas may be registered as fit for the production of "N.Z. Brown-top Certified Free from Red-top" if a field inspection indicates that red-top is absent from that area.

General Conditions.

APPLICATIONS.

Application for certification should be made by the party owning the produce to be derived from the stand. Application forms are available from the Fields Superintendents of the Department.

These forms contain a clause wherein the grower signs a declaration as to the age of his pastures, and this information is corroborated from outside sources. The age factor has no bearing upon the certification of brown-top.

REGISTRATION.

Each farm receives a number, and each paddock on the farm receives a letter. To indicate the source of origin the registered numbers are prefixed by letters as follows:—

Southland	S.	Thames Valley	T.V.
Otago	O.	Bay of Plenty	B.P.
North Otago	N.O.	Central Plateau	C.P.
Central Otago	C.O.	South Auckland	S.A.
South Canterbury	S.C.	King-country	K.
Mid-Canterbury	M.C.	Taranaki	T.
North Canterbury	N.C.	Wanganui	W.
Marlborough	M.	Manawatu	MN.
Nelson	N.	Wairarapa	WA.
North Auckland	N.A.	Hawke's Bay	H.B.
Auckland Central	A.	Poverty Bay	P.B.
Waikato	WK.		

It is thus possible to trace back to the paddock of origin each line of certified seed.

FIELD INSPECTIONS.

In the case of rye-grass, field inspections may be viewed as supplying corroborative evidence upon the sample trial report, and in brown-top as determining that no red-top is present. In the case of white clover, age is the only factor, and field inspections prior to threshing are necessary only in the case of unregistered areas.

SEALING IN PADDOCK.

The responsibility must rest upon the grower to give due notice of his intention to thresh certified seed, and a certification officer is justified in refusing to seal the sacks if he has any reason to doubt the origin of any portion of the seed. The officer will endeavour to be present during or immediately after threshing, to count, seal, and brand the sacks. He will require the grower or some responsible person to sign a declaration guaranteeing that the sacks he has sealed and branded contain no seed other than the produce of the registered area.

MACHINE DRESSING.

Following paddock sealing the seed will in the ordinary course be sold, and its location lost, until notification is received from a merchant of his intention to machine-dress some certified seed. The responsibility must rest with the merchant to notify the local officer of the Department of Agriculture dealing with certification of his intention to machine-dress certified seed.

This will receive the officer's immediate attention, and he will (1) obtain the number of sacks and their weight; (2) remove the seals and allow machine dressing to proceed; (3) supply the number of tags required; (4) inspect the dressing returns; (5) obtain the number of sacks and weight of dressed seed; (6) seal up the sacks of machine-dressed seed; (7) draw a sample for purity and germination test, which is forwarded direct to the Department's Seed Analyst at Palmerston North.

PURITY AND GERMINATION CERTIFICATE.

This is prepared by the Seed Analyst, and is forwarded direct to the grower or merchant owning the seed. Each purity and germination certificate is numbered, and the certificate also bears the registered number of the seed to which it refers. The tags attached to the sealed sacks will also have printed on them the registered number and the purity and germination certificate number. In this manner the one can be always identified with the other.

To facilitate resales no names are mentioned on either tags or certificates. The seed is identified by the numbers already mentioned, and is bought and sold upon the evidence contained in the purity and germination certificate accompanying the line.

BLENDING AND RETURN OF SALES.

Merchants should give notice of their intention to blend, so that an officer may be present to check weights and remove seals.

The officer will then issue fresh tags, and take steps to obtain a purity and germination certificate of the blend. On both tag and certificate will be indicated the several registered numbers indicating the origin of the blend.

In due course merchants will be requested to send in a return of sales of certified seed to enable the seed to be traced to the grower, who may, at a later date, apply for certification.

MISCELLANEOUS.

It is not intended at present to make any charge for certification, but the usual charge of 2s. will be made for each purity and germination certificate issued.

The Department does not buy or sell certified grass and clover seeds. It is hoped that certification will not in any way interfere with the usual channels of trade. Farmers and others wishing to purchase certified seed should make arrangements through the merchants with whom they usually deal.

Further information may be obtained from the Fields Superintendent, Department of Agriculture, at Auckland, Palmerston North, Christchurch, or Dunedin, to whom also applications for certification should be made.

REGRASSING OF SECONDARY-GROWTH COUNTRY.

THE annual report of the Fields Division for 1928–29 makes the following statement on experimental work on secondary-growth country, which is being carried out mainly in Whangamomona County :—

The experiments on regrassing secondary-growth country have been continued, and some additional 30 acres have been sown. It is very gratifying to report that the species and mixtures recommended for these sowings are now being widely adopted by the hill-country farmers, and the work is really progressing of its own momentum. During the year our attention has been focused on the menace of hard-fern (*Paesia scaberula*). This troublesome secondary growth defies the ordinary methods of control. Firing is not entirely effective, owing to the green edge that will not burn unless the area has reverted to one entire mass of this fern. Crushing with cattle and hard-grazing sheep increases rather than decreases the amount of hard-fern ; men's hands, wielding slashhook or grubber, are impotent against its spread. During the past three years spraying tests with arsenical compounds, mainly arsenic pentoxide (As_2O_5), have been thoroughly tried out, and it is very gratifying to report a marked degree of success. In 1926 approximately ¼ acre was sprayed ; in 1927–28 approximately 26 acres were successfully dealt with, and in 1928–29 over 100 acres have been treated. Experiments are now afoot to clean up some 200 acres in all, and to find out over a period of years the amount of spraying and cost to keep this area entirely free of hard-fern. Control of hard-fern will put quite a different complexion on the control of other secondary growths—throughout the Taranaki back-country at least. Crushing is absolutely essential to control bracken-fern, and the menace of hard-fern induced as a result of hard crushing has been a big influence towards lighter stocking, and consequntly has prolonged enormously the struggle against bracken. Hard-fern control assured, more confidence will be inspired in the regrassing of the country, and effective bracken-control methods may be vigorously applied.

DISEASES OF DAIRY COWS.

OBSERVATIONS IN EUROPEAN CENTRES.

(Continued.)

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II. CONTAGIOUS BOVINE ABORTION.

THIS interpretation of the fight against contagious bovine abortion is based on facts collected by the writer during his tour of the Continent of Europe, when he had the opportunity of discussing the control and elimination of epizootic abortion in dairy stock with well-known authorities on the subject, including Professor Bernard Bang, of Copenhagen, whose name has been closely associated with the problem for the past thirty-five years.

At the outset it must be remembered that no simple method of attack is available, but yet by following consistently certain now well-established practices the disease can be eliminated from the herd. Under certain circumstances these control measures may be costly and difficult, but even the smaller stockowners should be prepared at least to adopt certain practices to limit the spread of infection within their herds, and thus contribute towards a general organized attack, which may be provincial or national, but at all times under veterinary supervision.

The etiology, diagnosis, and control of contagious bovine abortion has engaged the attention of research workers for the past fifty years, while the act of abortion with its attendant sequelæ — metritis, sterility, &c. — still presents an economic problem of ever-increasing importance to the dairy-farmer, due mainly to the greater traffic in live-stock, at any rate in the more civilized countries. A considerable amount of excellent work has been done by both field and laboratory workers on this important disease of dairy stock, yet the farmer in most countries still anxiously awaits a satisfactory and economic method of control and elimination.

The losses generally associated with *Bacillus abortus* infection are only partly appreciated by farmers, and accordingly the true significance of the disease would appear to have been missed in the daily conduct of the milking-herd. Associated with the abortions and the loss of the calf are the birth of weak, if not non-viable, calves, which so often fall victims to other post-natal infections; next, the breeding abnormalities and insufficiencies associated with placentitis and endometritis, retained membranes, and sterility even; subsequently, the infection of the udder, the reduced milk-yield (generally considered at one-third of the total for the normal lactation), and perhaps, what is of even greater importance, the infection of the milk with *B. abortus*, presenting the possibilities of transmission to other animals, including man; finally, there must be added the greatly reduced sale value of the herd, under rational and honest conditions of animal husbandry where non-disclosure at time of sale permits of legal interpretation, whereas under certain systems of dairying, premature calvings associated with *B. abortus* infection present difficulties in regard to the seasonal lactations.

ETIOLOGY.

One of the most interesting pieces of research work yet published regarding contagious bovine abortion consisted in the important findings of Dr. Bang in 1896. Bang, assisted by Stribolt, examined the thick yellowish turbid fluid found between the uterus and the fœtal envelopes in an aborting cow, and isolated in pure culture a very small organism, which they subsequently cultivated abundantly on artificial media. These experiments of Bang are now classic in that they established the etiology of contagious bovine abortion, and accordingly enabled other investigators to work on a sure foundation. As these researches have been extensively published, it is unnecessary to give the details here of the isolation and cultivation of the causal organism which is now known as *Bacillus abortus*, *Brucella abortus*, or *Alcaligenes abortus* (Bang). It will suffice, therefore, to state that the isolation of the specific organism from bovine tissues or secretions, including milk, or from the envelopes or discharges of the fœtus, is possible only by means of special culture media, suitable environment, and a well-developed and special technique.

THE ACT OF ABORTION.

Abortion in bovines may result from many causes, such as physiological insufficiencies, traumatic injuries, or infectious diseases. When arising in the course of the latter the abortion may be sporadic, enzootic, or epizootic; but it is with epizootic or contagious abortion, caused by *B. abortus* (Bang), that we have to deal. It is now generally accepted that from 10 to 15 per cent. of abortions in a herd are due to other causes than this infection, although frequent abortions invariably suggest such infection.

It is interesting to note that according to M. Rinjard, of the National Research Laboratory, Alfort, France, from the examination of some thirty thousand blood-samples from bovines, 10 per cent. of abortions were due to some other organism than *B. abortus*. M'Fadyean and Stockman in Britain, Theobold Smith in America, Thomsen in Denmark, and Gminder in Germany have all described, in both sheep and cow, abortions caused by a "vibrio." Theobold Smith and Taylor in America report *B. abortus* in 57 per cent. and vibriones in 24 per cent. of 109 cases examined. Wall and Magnusson in Sweden, and Theobold Smith and Taylor in America, have discovered *Bacillus pyogenes*. Bang, Thomsen, and later Plum, in Denmark, have shown that many cases of abortion are due to *B. tuberculosis*—up to 3 per cent. of the cases examined; and of these 5 per cent. were due to avian tuberculosis. Mould infections of the uterus, chiefly mucor and aspergillus, have been described as causing abortion, by Theobold Smith, Carpenter, Birch, and Gilman, in America, and also Bang and Bendixin in Denmark. Other causes have been recorded—namely, streptococci by Thomsen in Denmark, and Oppermann in Germany, paratyphosus by Schermer and Ehrlich in Germany, and finally specific infectious diseases—for example, foot-and-mouth. These facts are recorded here because only too often figures are published regarding abortion in a herd in vaccination experiments without the true cause of such manifestations being carefully diagnosed.

The act of abortion cannot be taken as the criterion of infection by *B. abortus*, and the number of abortions in a herd cannot be assumed as an indication of the extent of infection, whereas the mere fact that there are no abortions does not necessarily mean freedom from infection. Abortions would appear to be more prevalent among second calvers. The earlier in pregnancy in which abortion manifests itself, the greater is the chance of an abortion in the subsequent pregnancy. It has been stated that 75 per cent. of cows which abort once develop a so-called immunity, or resistance to subsequent infection, and do not abort again. Cows often abort a second time, and in many cases even three times in succession, whereas others may appear to recover but succumb to a later infection. The earlier in pregnancy that infection occurs the longer the act of abortion is delayed.

SPREAD OF INFECTION.

Contagious abortion in a herd is insidious in its onset and slow in its progress, and infection may be present in a stock for many weeks or even months before any actual cases of abortion occur. It has been recorded that the act of abortion may become manifest as early as thirty days after infection in the case of the pregnant bovine.

The disease is generally introduced into the herd by the addition of an infected animal from another farm, usually a pregnant cow, although a newly purchased bull may also carry the organism localized in the genital tract. The temporary removal of cows for breeding or show purposes is also a fertile source of spread of the infection, and equally so the admission to the farm of infected cows for service, when infection may be left with the herd bull, or yards and paddocks may be contaminated with genital discharges. The method of infection is by ingestion of infective material, either artificial feeding-stuffs, pasture, or drinking-water, contaminated with discharges from an aborting cow. Again, infection may result from cows licking each other, and particularly so when cows are in œstrum, or during normal involution after the act of abortion. Bulls may also become infected in this way. Cows artificially infected by feeding living cultures have given a positive blood-test as early as three weeks. Infection may be carried in the milk of non-pregnant cows, and thus calves contract infection, which very soon leaves the body by the digestive tract, thus contaminating the pasture. Experimental methods have shown that the specific organism may be introduced into the animal-body by all possible modes of entry, but, in view of the contaminated nature of the natural surroundings, the digestive tract would appear to offer the most reasonable portal of entry. This is now generally accepted as the chief method of infection, thanks to the researches of Bang, McFadyean, and Stockman.

Vaginal infection is not now considered as important, since at time of œstrum the conditions in the uterus are not compatible with those favoured by *B. abortus*. A mass infection per vaginum may result in a direct uterine contamination occasionally, but this would surely be rare, whereas the antiseptic conditions existing in the vagina would result in an abortive infection. As for transmission by the bull during the act of coitus, the almost universal opinion held to-day is that it may be possible but very rarely occurs. Yet the elimination of the organisms in the seminal fluid may reasonably furnish a source of

infection by contamination of the pasture. Physical contact would appear to offer opportunities for spread, and accordingly the paddock would favour infection more than would the cow-shed. The viability of the organism is important in outlining preventive measures. It may be said that the contagion is not long-lived under field conditions, although within a mummified fœtus the organisms can survive for as long as nine months. Again, the spread of infection by attendants would appear to have been overrated, since mediate contact has been proved to be unimportant. This is a very important finding, and one which would permit of a more practical interpretation of the elimination of contagious abortion by segregation, a problem which is discussed later.

Having thus considered the means by which the disease is introduced into a herd, and also the method of infection and spread, it will suffice to conclude this part of the survey by considering the incidence and localization of the organism in the bovine species, and the chief sources of contagion.

In bovines, at least, the receptivity varies according to sex, the pregnant female offering the environment of choice, whereas the male harbours a more passive infection. There is also a difference according to age; a young bovine does not offer favourable conditions, for the calf nourished with infected milk (the milk of its mother) shows the presence of infection by the development in its blood of the power of agglutination, but when the infective nutriment is withdrawn it very quickly rids itself of all infection. In the case of virgin heifers, one recognizes the marked tendency to throw off infection, except in the circumstances when they remain in contact with infected adults, yet the infection disappears spontaneously if they are removed from the risk of repeated infection.

The localization of the organisms in the animal-body is of importance also. All the tissues of the body do not offer a suitable medium for the development and retention of *B. abortus*. It is the gravid uterus which supports the heaviest infection; the fœtal membranes, the anmionic fluid, the aborted fœtus, the supra-mammary glands, and the udder in the cow, the epididymus and the vesicula seminalis in the bull, are the situations which permit of multiplication or of localization of the organism.

At the time of calving or abortion, and during the days immediately following, the virulent bacilli are liberated with the fœtal fluids as a veritable bouillon culture, with the fœtal membrane and aborted fœtus as a mass infection, and in the subsequent uterine discharge so long as this continues, which may be only a few days for normal involution, but often for many weeks when metritis supervenes. Here, then is the chief source of contagion.

When cows are permitted to calve or abort in the common herd the extent of spread of infection would be considerable, when it is realized that in the third year of a serious outbreak it is not uncommon to find 50 to 60 per cent. of cows aborting, and thus disseminating the infection throughout the herd by the contamination of pastures, yards, drinking-water, and feeding-stuffs even.

Following the act of abortion, the organisms are eliminated with the normal discharges, and usually in about three weeks the uterus has freed

itself of all infection. Only on one occasion have the bacilli been demonstrated after fifty-one days. The bacilli still remaining in the system migrate to the now functioning udder and may be eliminated in milk—at least with 30 to 40 per cent. of infected cows.

Infection in the cow-shed or milking-bail may occur from contamination with milk, or infection may be carried to other lactating members of the herd by the hands of the milkers or the teat-cups of the milking-machines; and, what perhaps is also an important problem, infection may be conveyed to human beings when the milk is consumed. Infection may then remain localized in the udder and supramammary gland for years, and the animal becomes a "carrier" of infection. Many of these carriers to all appearances calve normally, but the contents of the uterus are usually infective, since the udder serves as a revervoir of infection for subsequent pregnancies.

Contagious bovine abortion can no longer, therefore, be considered as a "specific uterine catarrh," a disease of the fœtus and its membranes, but rather as a general chronic infection, in which the act of abortion is certainly not a necessary consequence of the disease. It is important to recognize that the recently infected cow which calves to time is almost certain to be a "spreader," and perhaps, therefore, of the greatest danger to the herd.

Carriers may also be represented by the bull, but they are of much less importance, especially in well-managed herds. It is the vesicula seminalis which are most frequently affected, and it is with the secretions that the organisms may pass out; when this takes place, even in the absence of coitus, contamination of the surroundings may occur as noted above.

DIAGNOSIS.

The existence of *B. abortus* infection in a herd can only be satisfactorily diagnosed by laboratory methods, since, as has already been stated, the number of abortions is no indication of the extent of infection. The fact, however, that a number of animals calve prematurely and at different times is suggestive of the clinical manifestations of contagious bovine abortion. Microscopical and cultural examination of material from the placental exudate, or from the liver, heart-blood, or intestines of the aborted fœtus, frequently demonstrate *B. abortus* alone as the invading organism.

Serological reactions must perforce be resorted to in diagnosing the disease in the herds and in estimating the extent of its progress. The agglutination or blood test is the most important means by which diagnosis is confirmed. This test depends upon the power of the blood serum of an infected animal to cause the bacilli suspended in a weak saline solution to clump together and fall to the bottom of the test-tube. This test takes twenty-four hours to carry out, since incubation at a definite temperature is necessary before the result can be known. It is to be remembered that this test is not a test for the act of abortion, and does not indicate that a cow has already aborted or will abort, but rather a test for anti-bodies circulating in the blood resulting from the response of the animal to the presence in the system of the organisms causing contagious bovine abortion.

The agglutination test as carried out in laboratories of repute is exceedingly reliable, since under such circumstances the technique and interpretation is left to experienced workers. Objections have been raised regarding the efficacy of the test, but usually these result from careless methods and want of organization in handling large numbers of samples. The extent of the reaction to the test, or, in other words, the agglutinating titre, is very variable amongst the individuals within the herd, and also equally so during the course of the disease. Such differences and fluctuations will indicate that the titre is not a static but a variant. A cow which harbours *B. abortus* may give a negative reaction even up to one month after the act of abortion, and then suddenly change to a definite positive. A definite high reaction will indicate that the animal will probably remain infected for a very long time, even indefinitely, and when such a reaction disappears it is generally a very long and gradual process extending to many months or years. In contrast to tuberculosis in bovines, it is interesting to note that once the animal is a reactor it is not always a reactor. Doubtful reactors or low reactors often cease to test positively when the infection is thrown off, but, again, they may become chronic reactors or carrier cases. Many reactors never abort, but calve normally a live calf, and continue to spread infection during each calving. From what has been said it is evident that the result of one test is not sufficient to exclude doubtful or negative reactors, and accordingly cases of incubation, latent infections, and recently aborted cows must be eliminated by several tests at four to six weeks intervals.

Several modifications of the agglutination test have been devised in order to reduce the time occupied in carrying out the test, and also to furnish a suitable technique for use in the field, but since the principle involved is very much similar, details are omitted here.

Another method of diagnosis which may facilitate work in the field depends upon the reaction on the part of the animal to intravenous, subcutaneous, or intracutaneous injection of products of disintegration or extracts of the dead bacilli. The response may therefore be thermal, or merely a cutaneous hypersensitiveness, similar to the reaction obtained by the use of tuberculin in the diagnosis of tuberculosis. The true nature of such reactions is not very well understood, and accordingly a satisfactory procedure is very difficult to determine. If the success claimed by the authors of such tests with bacterial products or residue can be satisfactorily repeated, a most promising diagnostic procedure will become available for employment in the herd. Further reports will be awaited with interest by all workers and all owners of live-stock.

The clinical manifestations and symptomatology of the disease within the herd may be suggestive of contagious bovine abortion, but for definite diagnosis reliance must be placed on microscopical examination of material from the cow which has aborted or from the aborted fœtus, confirmed by one or other of the serological tests utilized in the examination of a blood-sample taken from the cow not earlier than fourteen days after the act of abortion.

For the examination of milk for the presence of *B. abortus* the agglutination test has been suggested, but more satisfactory results are obtained by guinea-pig inoculation or suitable cultural methods.

Control and Elimination of the Disease.

Having so far satisfied ourselves of the efficacy of the methods of diagnosis of contagious bovine abortion, measures for the effective control and elimination of this disease may now be advanced and discussed. The problem may conveniently be dealt with under three headings—(1) Sanitary police measures or State intervention; (2) measures for the prevention of the introduction of the disease into herds free from infection; and (3) elimination measures in infected herds. Towards this end it will be necessary to apply one or more of the following measures in order to combat successfully this bovine scourge: (*a*) Diagnostic control, (*b*) hygienic precautions, (*c*) isolation requirements, (*d*) vaccination or immunization.

A very careful diagnosis of the extent of the infection in the herd is absolutely essential before methods of isolation can be devised to meet the requirements of the owner and at the same time suffice to keep in check the ravages of the disease. The hygienic measures generally recommended are such as should always be enforced in breeding or other herds, in order to prevent the introduction and to limit the spread of both infectious and non-infectious disease. The isolation requirements can only be outlined by the veterinarian in charge, and are governed by the nature of the infection, the method of spread, and the viability of the organism. Finally, where vaccination is possible and the situation warrants its use, it must on no account be proceeded with if all or any of the complementary measures are not being carried out to the letter, otherwise the veterinarian in charge will only have himself to blame for unsatisfactory and undesirable results.

(1) SANITARY POLICE MEASURES OR STATE INTERVENTION.

The question of the eradication and control of diseases of live-stock which are insidious in their onset and chronic in their progress is a very difficult one for many reasons. Firstly, the early notification and clinical diagnosis is always a difficulty; the gross carelessness on the part of the stockowner facilitates the spread of the contagion; the efficacy of laboratory methods of diagnosis is often in question; and, finally, the payment of compensation for total loss may often be the deciding factor. The eradication of tuberculosis has been attempted in most countries, but it is only in those such as the United States, where the Government is ready to give all financial assistance for administration, diagnosis, and full compensation that progress seems to have been made. Considering now contagious bovine abortion, we have a chronic disease of dairy stock second only to tuberculosis in respect of the losses occasioned thereby. In the smaller countries, such as New Zealand, the only successful policy is to get the stock-owners interested in the work of elimination and by united efforts to clear up the individual herds. The details of such a scheme would have to be carefully drawn out, but it will suffice here to suggest that in addition to giving veterinary service, either free or at a nominal charge for diagnosis and vaccination (if the latter be advisable), an order prohibiting exposure of infected animals in locations likely to transmit infection to healthy stock belonging to others would have to be put into operation.

In Great Britain, Denmark, and Norway such an order has been made by the Government, and it may be summarized as follows: "Prohibition of exposure in the market, fair-ground, or sale-yard; prohibition of sale without notification of disease; prohibition of service without notification; prohibition of turning out to graze on any common or unenclosed land, in a field or other enclosed place not fenced so as to prevent cattle entering or escaping, on the side of the highway, on any land on which there are cattle which are not the property of the owner of the cow so exposed." This applies by law to any cow or heifer which to the owner's knowledge, or according to information furnished to him, has calved prematurely within two months immediately preceding such exposure. The text of the order in the three above-mentioned countries is drafted on the same lines.

So far as the writer is aware, no cases have been dealt with summarily for violation of the order in Great Britain, but the fact remains that the onus of disclosing and therefore of proving the existence of *B. abortus* infection as the cause of premature calving rests with the owner of the animal. In view of the fact, however, that practically no progress has been made in Britain towards the elimination or control of contagious bovine abortion—or, in other words, that no organized attempt has yet been formulated—it would appear that possibly this order is of no value; but it can be appreciated that so far as legislation is concerned the Ministry of Agriculture has carried into effect its part of the combat against this disease.

At the same time, it may be mentioned that in Britain a living vaccine is supplied at a nominal charge to veterinary surgeons, and a small amount of laboratory diagnosis is carried out at the Government laboratory. In practically every country of Europe also diagnosis is carried out and living vaccines are supplied.

It would appear, then, that only when the stockowners are alive to the grave losses occasioned in their herds and bestir themselves to make an effort on their own behalf to eliminate the disease will it be possible to understand how Government intervention can prove of value in what must be considered in every country a national problem.

(2) MEASURES FOR PREVENTION OF INTRODUCTION OF THE DISEASE INTO A CLEAN HERD.

Fortunately in every country there are still herds which are free from infection with *B. abortus*, and accordingly it is imperative that one should be able to suggest the means whereby the introduction of the disease can be prevented. Many small herds are free from *B. abortus* infection, but few of the very large herds contain no reactors to the initial blood-test. Herds which are free from the disease are invariably those whose owners raise their own stock, never purchase from without, and allow no interchange of stock whatever. The methods of management in such clean herds would naturally suggest the means towards this end.

It has been realized that in *B. abortus* infection we are dealing with a disease of relatively low contagion, and accordingly for a clean herd to become infected it is necessary to introduce an infected bovine, or temporarily expose a non-infected animal in an infected environment. Contact is therefore necessary, either with regard to the animals or

by bringing contaminated material into the clean herd. Here, then, is the keynote to success in preventing the introduction of the disease into an abortion-free herd.

Recent Purchases. The first of the only two real risks of contamination is the purchase and introduction into the herd of an animal either in the incubation stage or in a state of latent infection. All adult animals purchased should be immediately isolated and subjected to at least three agglutination tests, at four to six weeks' interval; in the case of pregnant females one of the tests must be carried out two to three weeks after calving (or abortion).

In order to shorten the period of isolation, it is advisable to buy young cows as near as possible to the first calving, when an agglutination test is carried out at time of purchase, and also at two to three weeks after calving. In view of the fact that young stock quickly eliminate infection from the system, it is also advised that virgin heifers and bulls of one year should be purchased, isolated out of doors, and tested at time of purchase, and again after several months. It is advisable, however, that before having the heifers served, and before using the bulls, they should have passed three agglutination tests. It may happen that these young bovines have come direct from an infected herd, when positive results may be obtained from the test, but on isolation they will generally throw off the infection very quickly.

Temporary Removals. Animals belonging to the herd should not be exposed to infection outside and then returned to the farm—for example, exposed at saleyards and shows, grazed on unenclosed pastures or public highways, or even in fields improperly fenced where other bovines have access, removed for service to bulls in adjoining herds; and, finally, animals from neighbouring farms should not be allowed to come in for service or otherwise. Although the bull is not considered as likely to transmit infection, there remains the risk of a visiting cow contracting the disease by consuming contaminated food or water. As already indicated, these control measures are the compulsory provisions of the contagious abortion orders of Britain, Denmark, and Norway.

Special Bulls.—The rigid methods of isolation necessitates the keeping of a bull or bulls to be used in the herd only. Where desired, a special bull may also be kept for the purchased animals if this part of the business is extensive.

The Calving Paddocks or Boxes.—These may be considered as absolutely essential in a breeding-herd, and more especially so for newly purchased cows. Calving-boxes, where provided, should be suitably constructed for rapid and efficient cleansing and disinfection. Disinfection should be continued until the result of the blood test immediately following calving is known.

Hygienic Measures. Disinfection and cleansing should be carried out at all times, and antiseptic and aseptic precautions in particular in parturition work.

Agglutination Tests. It is not sufficient to assume that the herd is free from infection because no abortions have occurred to date, and therefore it is absolutely necessary to carry out an initial blood test of all animals of breeding-age in the herd. Subsequent testing should be carried out twice a year, and later only once, until the incidence of the disease in the country or district justifies a longer interval. An

agglutination test, performed two or three weeks after calving, should be made the rule in all cases for the first year at least, since this is the most likely time for a positive result to be obtained.

As already stated, where it is necessary to purchase additions to the herd, bovines so introduced should be bought on the test. It must be noted, however, that non-reacting cows from a herd containing reactors may possibly be infected, but in the incubative stage of the disease. This is especially so in the case of pregnant cows.

It is obvious, then, that all purchases must be isolated till they they have passed at least two additional tests at four- to six-week intervals. The only procedure which can be recommended as relatively safe is to purchase from herds certified clean by means of the test animals to be subsequently tested as stated above—that is, of course, for addition to clean herds as determined by the blood test.

Protective Inoculation or Vaccination.—The efficacy of the many methods of serum and vaccine therapy suggested for the protection of clean herds has not been proven, and accordingly in this respect there is nothing of value to report here.

(*To be continued.*)

BLISTER DISEASE OR CRACKING OF APPLES.

SUCCESSFUL REMEDIAL MEASURES IN NELSON DISTRICT.

B. G. GOODWIN, N.D.H. (N.Z.), Orchard Instructor, Christchurch (late of Mapua).

MANY varieties of both apples and pears are subject to a disease which causes cracking of the skin, in some instances extensive. Especially is this the case with the Dunn's Favourite apple, which will be referred to more particularly in these notes. This variety has in the past been extensively planted for export, but owing to the trouble with cracking experienced during recent years, the quantities exported have diminished by thousands of cases. A large number of fruitgrowers have already reworked this apple with other varieties, being of the opinion that nothing could be done to successfully combat the disease.

Cracking of Dunn's has been general throughout New Zealand, irrespective of difference in climatic conditions or quality of soil, both rich and poor classes of land giving similar results in this respect. The appearance of the disease on both trees and fruit is so well known to growers of the variety that a description might be considered superfluous. However, for the benefit of any orchardists who are not so familiar with the trouble a brief description will be given.

On laterals it is abundant on one- and two-year-old wood. On this growth it appears in the form of small irregularly shaped blisters, which stand above the surface of the bark. These blisters may occur singly, scattered over the surface of the bark, or aggregated into groups forming large and irregular areas. Generally they have an unbroken surface, but on older wood the blisters not uncommonly crack across, giving to the bark a rough and scabbed appearance. When the blisters are scattered their presence is difficult to detect, but when confluent they are quite conspicuous.

On fruits a russeted condition is produced, but if affected when young large unsightly cracks may be formed. These are more prevalent near the stem end of the fruit, but occasionally are to be found on the side, and where badly affected the cracking extends completely round the apple. These cracks are usually large, crescentic, possess rounded edges, and are quite rough to the touch.

The trouble may be regarded as due more to general debility of the tree than from other causes, the *Conothecium* disease (to use the mycological name) being an after-effect. This is suggested by the fact that practically all the sound fruit to be found on trees that are affected through not having received proper treatment are situated near the top, where the growth is stronger. The lower buds have become so weakened and immature through the debility of the trees that it is impossible for them to maintain sufficient vigour to produce sound fruit.

Following up these deductions it is obvious that the stamina of the tree should receive first consideration in order to produce fruit free from cracking. This increased stamina can be induced by practising a system of heavy pruning, combined with manuring and cultivation. All lateral wood growths and subleaders should be removed entirely, and where fruit spurs are prolific these should be thinned out and shortened in length, leaving only plump and well-formed buds. Where main branches or leaders are numerous these should be reduced, leaving not more than ten to fifteen, according to the growth-inducing conditions of the soil. Such a system of pruning not only assists in restoring the vitality of the tree (which is the main object in view), but also the greater portion of the affected wood is removed.

A brief account of some of the many successes that have been obtained in Nelson Province, where experiments have been recently carried out under the writer's supervision, will now be given.

In the Upper Moutere district, from an orchard bearing a heavy crop of Dunn's apples only between forty and fifty cases were fit to be exported during the 1928 season. The system of pruning as described was carried out during the following winter, together with applications of basic slag, blood-and-bone, and sulphate of potash. The results obtained were astounding, the quantity of apples exported from the same trees during the 1929 season amounting to 376 cases, an increase of over 300 cases. Moreover, at time of writing there was a splendid show of fine healthy fruit-buds for the next season.

In another orchard at Mapua, during the 1927 season, only sixty-five cases of Dunn's were fit to be exported owing to the fruit being badly cracked. Following out the system of pruning advocated the export from the same trees has increased to two hundred and fifty cases in 1928 and 1929.

As showing that hard pruning is essential to restore vigour to the Dunn's variety and enabling the trees to produce fruit free from cracking, another local case may be mentioned. An orchardist did not prune a portion of his Dunn's, intending to work them over with some other variety, but this he failed to do through pressure of other work, and the trees, being in a debilitated condition, practically failed to set any fruit; what few apples did set were worthless, owing to being cracked to pieces. The remainder of the trees, which were pruned

back severely (otherwise having exactly the same treatment as the first-mentioned trees), set a good crop, having a nice clear skin, and practically free from any sign of cracking.

As already indicated, however, pruning alone is not sufficient to combat the disease. Manurial treatment is also necessary to promote vigour, and for this purpose the following manurial combinations have been proved to materially assist the trees to produce payable crops, the quantities named being the per-acre rate: No. 1: 3 cwt. basic slag, 2 cwt. blood-and-bone, 1 cwt. muriate of potash. No. 2: 1½ cwt. sulphate of ammonia, 3 cwt. blood-and-bone, 1 cwt. sulphate of potash. No. 3: 3 cwt. fish-manure, 1 cwt. muriate of potash. One or other of these combinations should be applied as follows:—

No. 1: The basic slag (approximately 3 lb. per tree) at the latter end of May or early in June, ploughed in, as it is a slow-acting manure. The blood-and-bone (2 lb. per tree) and the muriate of potash (1 lb. per tree) in early spring—early in September—and either ploughed or well disked in.

No. 2: Blood-and-bone (3 lb. per tree) and sulphate of potash (1 lb. per tree) ploughed in at the latter end of August. Sulphate of ammonia (1½ lb. per tree) lightly cultivated in at the beginning of October.

No. 3: Muriate of potash (1 lb. per tree) ploughed in early in June. Fish-manure (3 lb. per tree) in early September, after the second ploughing is finished.

Whatever combination is used, it is also necessary to apply lime at the rate of 1 ton per acre, where such has not been recently applied.

Lastly, thorough cultivation must be recognized as essential throughout the season. Ploughing twice is far better than ploughing once. The soil should be turned over in early autumn—that is, the end of May or beginning of June—and again in early spring, immediately after the green-tip spray has been applied—usually about the early part of September. The ground should then be disked; and, as too much disking is inclined to make the soil run together and dry out, from then onwards it should be kept stirred up by the use of the cultivator. The number of cultivations given can only be determined by weather conditions; if dry conditions prevail more cultivation will be required than if the weather is wet.

If these essential factors of pruning, manuring, and cultivating are properly attended to, the growers of Dunn's Favourite need have no doubts about the production of a good crop of marketable fruit.

Exports of Stud Stock.—The following stud stock was exported during the year ended 31st March last: Sheep, 2,669; cattle, 164; horses (draught), 10. In addition, the usual shipments of trotting and thoroughbred horses were made to Australia, principally for racing purposes, but most of these animals eventually return again to New Zealand.

Butter Manufacture without Preservatives.—Manufacture of butter without preservatives, in order to comply with the British Ministry of Health's requirements, has been in operation during the whole of the past year. Tests for preservatives in butter intended for export from the Dominion have been carried out by the Dairy Division's Graders at intervals, and in no instance was it found that preservatives had been used, neither have any complaints been received from Britain in this connection.

OFFICIAL HERD-TESTING OF PUREBRED DAIRY COWS.

SURVEY OF THE SECOND SEASON'S WORK, 1928–29.

W. M. SINGLETON, Director of the Dairy Division, Wellington.

A BRIEF review and summary of records of the first season's operations under the official herd-testing system appeared in the *Journal* for September, 1928, and reference thereto will show that 31st July was accepted as the closing-date for the O.H.T. year. The second year's work, however, brought out the fact that at the same date in 1929 so many testing periods were incomplete as to make it advisable to select a later date for the termination of the season and as a basis for future tabulations. On account of the fact that the commencement of test for O.H.T. cows—similarly to C.O.R. entries, though perhaps to a lesser extent— is spread over a considerable portion of the year, no dividing-line which will make the summary wholly complete can be drawn. Up to the present, however, it would appear that 30th September is the most suitable closing-date, and consequently the present tabulation includes all cows which have completed their test between 31st July, 1928, and 30th September, 1929.

The fact that the Official Herd-test is conducted as an adjunct of the Certificate-of-Record system, and is, broadly speaking, confined to the testing of registered purebred dairy cows, implies the assumption that C.O.R. and O.H.T. support will run on parallel lines, and that no very marked variation from year to year in the numerical strength of one may reasonably be expected without a corresponding trend in the other. It must also be recognized that the Official Herd-test is a kind of halfway mark between the Group Test and the C.O.R., and therefore cannot be expected, nor was it intended, to assume very large proportions. At the height of the season under review testing was carried out for 1,666 O.H.T. cows in the hands of some 128 C.O.R. breeders, as compared with 1,550 cows and 102 breeders for the preceding year. The number of cows actually covered by the entire season's work was 1,970.

This must be accepted as very satisfactory, and the work should be of considerable benefit to breeders and dairymen generally by way of getting a greater number of butterfat records behind our purebred dairy cows. There is room for an appreciable extension in the testing of these animals, as it would appear that the number of registered purebreds with authenticated yields represents too small a proportion of the herd-book entries. A stage seems to have been reached where one must recognize that the mere fact of an animal being in the herd-book of one of the dairy breeds is not sufficient, and that there is need for the testing of a larger proportion of our purebreds, together with a consequent classifying and weeding-out by means of an advanced or selective register or some other method. The Official Herd-test, linked up with the C.O.R. test, provides the foundation for an effective and economical movement in this direction.

Table 1 indicates the general position regarding number of breeders, number of cows tested, average production, &c., for the past season, the first year's results having been included for purposes of comparison. In the present summary the classification on the basis of all cows on test six months (180 days) or more has been retained as the most suitable for the majority of the principal tabulations. From the point of view of estimating the merit of average yields and the results generally, it may be unnecessary to remind readers that the O.H.T. is a ten months' test, 305 days being the maximum testing-period permitted by the rules governing the system. Table 1 does not include some 159 cows other than registered purebreds which were tested by special arrangement during the past season. There is also the point that although the total number of cows tested appears as 1,636, there were 165 cows registered purebreds and 10 cows other than registered purebreds withdrawn or dry prior to the 180 days, thus making a total of 1,970 cows. Moreover, had this table been based on cows on test 100 days or more the number would have been 1,736, indicating that 100 cows dropped out between 100 and 180 days.

Table 1.

Breed.	Number of Breeders.	Number of Cows.	Average Yield for Season.		
			Days in Milk.	Milk.	Butterfat.
				lb.	lb.
Season 1927–28.					
Jersey	73	605	274	5,709·9	305·79
Friesian	20	376	263	7,526·8	264·29
Ayrshire	2	65	253	5,712·6	232·02
Milking Shorthorn ..	5	53	252	5,646·9	228·64
Red Poll	2	28	283	6,254·1	267·18
Totals ..	102	1,127	268	6,326·8	283·10
Season 1928–29.					
Jersey	99	817	276	5,705·1	306·30
Friesian	24	546	274	7,976·8	275·17
Ayrshire	8	106	282	7,182·8	280·89
Milking Shorthorn ..	7	108	266	6,496·6	250·39
Red Poll	4	59	261	5,901·1	239·77
Totals ..	142	1,636	275	6,618·3	288·17

The table requires no comment, and the position indicated is extremely satisfactory, each branch of the tabulation except one showing an increase over the first year. For those who are interested in making comparisons with other commonly adopted classifications it may be stated that an average compiled on the 100 days or more basis, as used for ordinary dairy herd-testing returns, gives a result of 280·33 lb. butterfat in 267 days, as against 240·59 lb. fat in 242 days for all cows on herd-test in 1928–29. The average C.O.R. cow in 1928 gave 469·53 lb. butterfat. In placing an estimate on the O.H.T. average yield one must bear in mind that the large majority of the cows are no doubt under ordinary dairy-herd conditions, and that in most cases the O.H.T. is likely to be a trial ground for untested cows rather than an attempt to break records with picked individuals.

Table 2, which also includes all cows tested 180 days or more during the period under review, gives particulars of the highest and lowest individual herd yields within each breed. While this table is interesting and is of a type commonly used, there are so many contributing factors that from a practical point of view the information is quite an inadequate foundation for judgment. One would require to know, among other things, the class of land, the treatment which the cows received, whether the higher averages represented special selections, and certain other influencing items as well.

Table 2.

Breed.	Highest Herd.			Lowest Herd.		
	Number of Cows.	Average Days.	Average Butterfat.	Number of Cows.	Average Days.	Average Butterfat.
Season 1927–28.			lb.			lb.
Jersey	4	305	514·71	2	257	197·79
Friesian	16	290	361·33	38	220	192·65
Ayrshire	27	265	255·39	38	245	215·41
Milking Shorthorn ..	6	283	288·87	5	219	205·62
Red Poll	24	285	277·13	4	268	207·45
Season 1928–29.						
Jersey	3	305	541·76	2	195	180·93
Friesian	6	305	417·48	12	263	219·30
Ayrshire	11	264	339·48	23	270	192·38
Milking Shorthorn ..	7	267	337·92	4	261	217·33
Red Poll	34	251	261·91	19	266	197·46

In Table 3 are given particulars of the highest and lowest cow for each breed. It will be noted that length of lactation plays a considerable part in most of the differences. Some very creditable performances are recorded among the highest yields, particularly when it is remembered that these are ten-monthly, not yearly, returns. It should also be stated that, except in the Ayrshire breed, the lowest producers were only two-year-olds.

In Table 4 is given an analysis of production for all breeds and for all cows tested 180 days or more. The corresponding table for last year is repeated for the convenience of those who desire to make comparisons. It is interesting to note the very desirable heavier clustering of records around the average-yield columns, and the comparatively small percentage in the lowest subdivisions. In last year's review one or two comparisons were given which it would seem may be repeated with advantage. The production of the average dairy cow (in milk and dry) in New Zealand for last year is estimated at 212 lb. butterfat, so that 1,408 of the cows under review equalled or exceeded that production. Our average tested cow for last season produced 240·59 lb. butterfat, whereas it is found that over 1,150 (70 per cent.) of last year's O.H.T. cows bettered that yield. The 159 cows other than registered purebreds which were tested under the O.H.T. system during the period under review gave an average yield of 246·73 lb. butterfat.

Table 3.

Breed.	Highest Cow.		Lowest Cow.	
	Days.	Butterfat.	Days.	Butterfat.
		lb.		lb.
Season 1927–28.				
Jersey	305	603·60	211	95·03
Friesian..	305	560·53	194	106·94
Ayrshire	305	398·79	225	107·84
Milking Shorthorn	305	419·29	199	120·68
Red Poll	305	447·52	254	144·82
Season 1928–29.				
Jersey	293	652·48	264	100·23
Friesian..	305	587·27	202	68·72
Ayrshire	305	432·22	182	153·40
Milking Shorthorn	305	607·42	217	117·48
Red Poll	234	373·12	257	113·36

Table 4.

Breed.	50–100	100–150	150–200	200–250	250–300	300–350	350–400	400–450	450–500	500–550	550–600	600–650	650–700	Total for Breed.
Season 1927–28.														
Jersey ..	2	11	44	84	153	147	92	49	13	6	3	1	..	605
Friesian ..	..	28	59	82	86	63	38	16	3	1	..	..	..	376
Ayrshire ..	..	13	13	11	15	11	2	..	..	..	..	..	..	65
Milking Shorthorn	..	5	16	11	13	6	1	1	..	..	..	..	..	53
Red Poll ..	..	1	3	6	11	5	1	1	..	..	..	..	..	28
Total, all cows	2	58	135	194	278	232	134	67	16	7	3	1	..	1,127
Season 1928–29.														
Jersey ..	..	11	73	139	172	194	127	56	29	8	3	4	1	817
Friesian ..	2	20	80	111	139	101	58	27	5	2	1	..	..	546
Ayrshire ..	..	..	3	28	39	27	4	5	..	..	..	..	..	106
Milking Shorthorn	..	10	15	33	29	13	4	3	..	..	..	1	..	108
Red Poll ..	..	5	9	20	13	10	2	..	..	..	..	..	..	59
Total, all cows	2	46	180	331	392	345	195	91	34	10	4	5	1	1,636

Table 5 (next page) classifies average production according to age for the various breeds participating in the O.H.T., the figures for the preceding season being included for comparative purposes. In the light of the foregoing particulars this table reveals nothing unexpected. The production trend is more or less normal, and in the case of almost every breed the proportioning of the records among the classes is typical.

For the peak month of the past season there were 128 herds on Official Herd-test out of a total of 225 herds on Certificate-of-Record test; the largest number of cows under O.H.T. in any herd was 126, and the smallest number one cow. The average number of cows per herd was 11·5, a slight increase over the 1927–28 figure of 11. We should like to see this average higher still, being of the opinion that the fullest benefit cannot be obtained unless all sound and untested cows in the purebred herds are placed under Official Herd-test.

Table 5.—Average Production in Classes and Breeds for all O.H.T. Cows.

Class.	Season 1927–28.				Season 1928–29.			
	Number of Cows.	Average Days.	Average Milk.	Average Butterfat.	Number of Cows.	Average Days.	Average Milk.	Average Butterfat.
Jersey.			lb.	lb.			lb.	lb.
Two-year-old and under	219	275	5,094·8	274·32	283	274	4,849·7	261·68
Three-year-old	117	273	5,914·5	322·34	172	276	5,691·2	311·31
Four-year-old	97	277	6,206·1	331·85	115	276	6,151·0	333·48
Mature	172	270	6,062·5	319·23	247	278	6,487·3	341·27
Friesian.								
Two-year-old and under	121	257	6,005·1	213·78	183	279	6,751·8	234·88
Three-year-old	73	261	7,586·2	260·87	106	275	8,055·2	278·84
Four-year-old	58	272	8,363·2	292·79	75	273	8,906·2	303·35
Mature	124	268	8,609·7	302·24	182	269	8,779·8	301·94
Ayrshire.								
Two-year-old and under	24	235	4,192·9	169·70	19	287	6,187·7	253·79
Three-year-old	15	258	6,061·5	234·57	20	282	6,765·4	259·98
Four-year-old	6	243	6,009·0	243·07	21	276	6,987·9	275·93
Mature	20	274	7,435·5	301·56	46	283	7,864·3	303·43
Milking Shorthorn.								
Two-year-old and under	25	252	4,589·2	191·39	22	268	4,610·6	187·84
Three-year-old	6	255	6,890·2	280·86	19	272	6,143·1	227·97
Four-year-old	4	257	6,961·1	284·56	13	262	6,714·4	263·21
Mature	18	252	6,359·5	250·56	54	263	7,336·9	280·67
Red Poll.								
Two-year-old and under	3	281	5,233·4	225·04	18	263	4,842·7	194·20
Three-year-old	8	280	5,372·3	230·51	8	267	5,706·9	226·29
Four-year-old	4	296	6,604·8	274·44	12	260	6,203·7	259·30
Mature	13	281	6,924·5	297·23	21	257	6,709·8	272·81

SPARTINA TOWNSENDII.

A VALUABLE GRASS FOR RECLAMATION OF TIDAL MUD-FLATS.

H. H. ALLAN, Systematic Botanist, Plant Research Station, Palmerston North.

1. Experiences in Great Britain and Continent of Europe.

"NEARLY sixty years ago a Gift from Heaven appeared on the salt marshes of Southampton Water—a grass which became known as *Spartina Townsendii*, and which has since spread aggressively along the muddy shores of both England and France." "In addition to being a botanical phenomenon of the first order, perhaps unique in the recorded history of vegetation, the spread of Spartina is raising economic problems which will have to be grappled with sooner or later. Though still in the phase of youth Spartina already occupies dozens of square miles of mud-flats in pure stands which continually get denser and denser. There seems little risk of error in asserting that in the future this area will expand to hundreds of thousands of miles. Subject to climatic limitations, wherever there is mud there will be Spartina. It is time for us to learn something about the properties of this amazing plant."

Flamboyant descriptions of plants that are to work wonders are a regularly occurring phenomenon, but the above two quotations from the pen of a sober botanist, Professor F. W. Oliver, F.R.S., of the University of London, sufficiently indicate that the possibilities of Spartina for New Zealand are well worthy of serious consideration. Indeed, considerable interest has already been aroused, and it would seem well to put before those concerned the present state of our knowledge on the subject. The first part of this article is based upon personal communications from, and the published papers of, various workers with the grass. I have especially to record my thanks for the help afforded me by Professor Oliver, Dr. O. Stapf, F.R.S., and the late Professor R. H. Yapp. The second part deals with the progress of tests with Spartina in New Zealand.

ORIGIN AND STATUS OF THE GRASS.

Spartina stricta, a rigid, low-growing, maritime grass, has been known on mud-flats in various parts of England and the Continent of Europe from very early times. *S. alterniflora*, a taller plant, made its appearance at Southampton Water and at the mouth of the Adour about 1829. This is an American species, and is supposed to have been brought over accidentally by shipping. *S. Townsendii* was found first at Southampton Water in 1870, and in 1910 it was reported from the French coast.

S. Townsendii was first recorded as a variety of *S. stricta*, but Stapf, after careful study, pronounced it to be distinct from that species; nor does it match any American form of that species. Stapf's view is that it is a natural hybrid between *S. alterniflora* and *S. stricta*. Its remarkable vigour of growth and its botanical characters support this view, as does the finding of a form near

Bayonne (*S. Neyrautii*) that is to all intents and purposes the same as *S. Townsendii*. On the other hand, if the plant be a hybrid, one would expect it to throw diverse progeny, yet the seedlings appear always to be of the usual *S. Townsendii* character, and to possess the same vigour of growth. Definite experimental and breeding tests have not so far been carried out.

LIFE-FORM AND HABITAT CONDITIONS.

By "life-form" is meant the general habit of growth a plant exhibits in its natural habitat or growing-place. A single tuft when planted out on the mud spreads laterally by stout underground stems, and soon forms a more or less circular patch. Under favourable conditions such a patch may extend at the rate of from 2 ft. to 3 ft. per year from its centre in all directions. Adjacent tufts will thus unite and finally form continuous sheets. Growth is more vigorous on the outer margins of the patches, where the stems are free from competition one with another and grow taller. The patch thus tends to exhibit a saucer shape. There are two types of roots—long, anchoring, deeply descending roots, and short, branching, feeding roots that form a dense mass in the surface layer. The patches hold and collect mud, thus rising gradually in level, and the mud becomes firm and stable. The flowering shoots reach from 1 ft. to 4 ft. or even more, bearing from four to nine erect close-growing spikes densely crowded with flowers. Flowering is irregular in extent, and spread over a long period. Generally the plant is a rather shy seeder, but occasionally an excellent crop of seed is produced. Erosion of the margin of a patch sometimes detaches tufts, which may establish themselves elsewhere and assist in the spread.

Spartina does best on soft tidal mud-flats within about 3 ft. of the high-water mark of spring tides. It does not care for more than about six hours' submersion per tide. Just what degree of salinity is most favourable has not definitely been ascertained. The plant thus occupies successfully areas that otherwise are left bare of higher vegetation, being aided in this by its remarkably complete system of air-spaces.

OCCURRENCE IN ENGLAND, FRANCE, AND HOLLAND.

Since 1870 *S. Townsendii* has gradually spread east and west along the sheltered coast-line behind the Isle of Wight. At Poole Harbour, which it reached in 1899, the plant has spread in a most remarkable way into all the inlets and bays. It reached Pagham Harbour in 1918, and has established at Rye since 1922. It has also been purposely introduced into other muddy estuaries in Kent, Essex, Suffolk, Norfolk, and the Firth of Forth on the east coast, and into the Severn and Dovey on the west. Lately plantings have also been made in Cork Harbour.

In the river-estuaries at Bayonne and Fuenterrabia *S. stricta* and *S. alterniflora* both occur, and at the latter place *S. Neyrautii*, hardly if at all distinguishable from *S. Townsendii*, was discovered in 1895. *S. Townsendii* was noted on the coast of Brittany in 1906 at Réville and Carentan, and at Tancarville, head of the Seine estuary, in 1915. By 1922 it had reached Deauville and Havre. The "few tufts" at

SPARTINA TOWNSENDII.

[*Drawing by V. D. Zotov.*

Carentan of 1906 have now filled a more or less continuous block of some four square miles. In the Seine estuary there is now a great belt from Carentan to Havre. Of this Oliver says, "From this belt stretch out almost at right angles into the estuary numerous streamers of Spartina tussocks in open formation. . . . In a few years' time this phase will have passed, and this north bank of the Seine will be a continuous prairie of grass." On the higher levels of one salt-marsh area the Spartina appears to have been dominated and suppressed by *Glyceria maritima*, a grass of much less value.

Dr. J. P. Lotsy visited Poole Harbour to study the grass in 1923. As a result of his investigations and those of Mr. A. G. Verhoeven, maritime engineer in charge of reclamations in Zeeland, the Dutch Government decided to make large-scale experiments. In 1924 Mr. Verhoeven commenced operations, especially in the Scheldt area. These experiments are already providing a great deal of information.

ECONOMIC APPLICATIONS.

Navigation.—To quote from Oliver: "The danger to navigation inherent in reclamation is this: When parts of a tidal estuary are banked off and removed from tidal action, by so much is storage space for water diminished; and this amount will be lacking for scour at the ebb. The result is that channels become choked and navigation suffers." The effect of Spartina at Poole Harbour appears to have been: (1) In the first stage much mud is transferred to higher levels, with a widening and deepening of the channels; (2) with the increasing spread of Spartina the rate of addition of mud to higher levels wanes. The result is that the rate of flow slows down, and the tidal water occupies a lower level than before. Both effects tend to a lessening of the scouring-power at ebb, and the encumbering of the mouth with silt. On the other hand, Spartina may have value in binding the banks and confining water to definite channels. Before extensive planting of Spartina is undertaken the navigation aspect must be considered, if that aspect is likely to be of any importance.

Reclamation.—Spartina is unique in its ability to colonize soft, deep muds submerged at high tides. From its habit of growth and the resulting raising of the silt its power as a reclaimer of such areas is very great. This is enhanced by its remarkable rapidity of growth. The experiences in Holland are worth noting. I quote from Oliver's "Vignettes from Holland": "These plantations have reached an impressive phase. The Spartina cuttings are mostly planted in the muds at 3-metre intervals, and have made three and sometimes four years' growth—such plants averaging 6 ft. to 7 ft. across. The most extensive of these plantations, covering about a square kilometre of mud, lie right across the Sloe, just south of the dam on which runs the railway from Flushing to the Continent of Europe. . . . The plants flower and seed freely by their second year, and self-sown seedlings can be detected. . . . . These seedlings are found useful for extending the lines further out, and are reported to give better results than cuttings. This patch alone must contain something like 50,000 tufts—an enormous undertaking when it is borne in mind that on the less soft muds a man can plant 500 a day, whilst on the softest, into which he sinks deep, only 200. The Dutch workers

scorn the help of mud-boards and go barefoot. . . . What impresses Mr. Verhoeven is: (1) The sturdy way in which Spartina settles in to its work, establishing, expanding, and flowering freely; (2) that it can occupy at once soft, mobile, untamed muds; and (3) raise their level perhaps 6, 8, or more inches a year. If this promise is borne out, it means that ground treated with Spartina should be ready to polder (*i.e.*, bank in) at least ten years earlier than would otherwise be the case; as this is cumulative, it means a great deal in terms of the country's future. . . . After inspecting these convincing experiments, it is evident that a new era has opened for Spartina, and the world should have no cause to hesitate in utilizing it wherever ground, climate, and economic conditions are favourable."

The most suitable planting methods appear to be these: Cuttings should be inserted in a nick in the mud about 2 in. or 3 in. from the surface, and the nick closed by foot-pressure. The cuttings should be in rows parallel to the shore and not more than 3 ft. apart. An acre will need about five thousand cuttings. When seed is tried, each seed should be pressed into the mud deep enough to ensure its not being washed away. Where the surface is covered by mats of low forms of vegetation the seed may be pushed under this.

Raw Material for Paper.—Experiments have shown that Spartina will make a very fair quality of paper. However, the difficulty of harvesting clean mud-free material, the great labour involved, and other difficulties, may prevent its economic utilization for papermaking.

Stock-feed.—Oliver states: "No one who has lived on a farm, bordering, *e.g.*, on Poole Harbour, can have remained in doubt as to the value of Spartina in the feeding of stock. Horses, sheep, and cattle eat it with avidity, and habitually make their way on to the Spartina meadows almost before the tide has run off. Farmers speak well of it except that it gives an undesirable flavour to milk. As the grass remains standing on its roots throughout the winter till April, it forms a most convenient reserve feed that can be cut as required."

Knowles has recorded an interesting experiment on the composition and nutritive value of Spartina, carried out in Essex. Analyses revealed the following composition, to which are added those of meadow hay for comparison:—

	Freshly Cut Spartina. Per Cent.	Dry Matter of Spartina. Per Cent.	Dry Matter of Good Meadow Hay. Per Cent.
Moisture	77·90	..	..
Ether extract	0·61	2·76	2·92
Crude protein	2·88	13·04	11·32
Crude fibre	5·00	22·95	30·69
Nitrogen—free extractives	11·18	50·27	47·84
Ash	2·43	10·98	7·23

The mineral components, as percentages of the dry material, are:—

	Spartina.	Pasture.
Silica	2·29	1·521
Silica-free ash	8·69	4·663
Chlorine	2·72	0·561
Phosphoric acid	0·782	0·516
Potash	1·82	2·394
Magnesia	0·967	..
Calcium oxide	0·45	0·464
Soda	Not determined	0·151
Total ash	10·98	6·184

These figures show that the dried sample of Spartina was of somewhat similar chemical composition to good or very good meadow hay. "The mineral composition of the plant is, however, somewhat unusual, as might be expected from its habit of growth."

For a feeding trial two samples each of about 10 cwt. of the dried plant were obtained from Poole Harbour. "The first sample was cut on the 18th July, and spread out on a drier piece of land within about 40 yards of the sea, where it was roughly dried for a period of a week of rainless but dull weather, put into bags, and despatched on an eight-day railway journey. On arrival it was spread out in bright sunshine for three days to 'make' thoroughly. The dry material was then chaffed, and the chaff spread out on a clean floor of an airy room for about a month, with frequent turning and mixing to ensure an even moisture content throughout. It is noteworthy that, even after this length of time and in the chaffed condition, the sample contained about 18½ per cent. of moisture. In the green condition, and during the haymaking process, there was a decided smell of the sea, and to a lesser degree also of seaweed. This smell persisted in the dried hay."

A second cut was taken from the same spot seven weeks afterwards. "Perhaps the most astonishing thing about this second cut, or aftermath, was the extreme vigour of growth in so short a period, the young shoots being from 18 in. to 20 in. in length, and the yield apparently as heavy as had been obtained at the previous cutting. . . . The sample of hay, for the second experiment, was cut on the 28th August, and, roughly made at Poole during eight days of rainless weather, reached Chelmsford three days later in a semi-green condition. The weather now experienced was so bad that the haymaking could not proceed, and the partly dried grass was kept under cover for about a month, when it was chaffed and spread out on the floor of an out-building for about a week, and then on the floor of a warm and airy room for a further fortnight."

The analyses of these samples showed :—

	First Sample.	Second Sample.
Ether extract	1·63	2·54
Crude protein	7·90	13·04
Crude fibre	30·61	29·65
Nitrogen-free extractives	49·85	43·00
Ash	10·01	11·77

The feeding trials aimed at determining the digestibility of the animal nutrients in the hay. Two twelve-month-old Border Leicester-Suffolk wether sheep were used, and the usual precautions taken. "It was found that the sheep readily ate green Spartina on first acquaintance with it, and that no difficulty was experienced in getting them to eat moderate-quality Spartina hay three days after their arrival on the farm." The percentages digested of the nutrients of the two samples are shown as follows :—

	First Sample.	Second Sample.
Ether extract	40·5	39·0
Crude protein	39·3	45·7
Crude fibre	62·6	66·0
Nitrogen-free extractives	48·5	46·0

In the first trial the animals were nine days on the Spartina before the nine-day experimental period was commenced. They were then

at liberty for six weeks. During the last month of this they received nothing but Spartina hay and were then subject, in their stalls, to a fixed ration for four days, followed by an experimental period of eleven days.

Knowles makes the following conclusions: "Poor Spartina hay is similar in composition, apart from mineral matter, to poor meadow hay, and is fully as digestible. . . . If very indifferently made Spartina hay has a nutritive value equal to that of poor meadow hay, it does not seem unreasonable to suppose that Spartina could be equal to good meadow-hay if favourable haymaking conditions could be obtained." The sheep maintained perfect health, and showed no signs of constipation, even when they were closely confined and fed solely on the hay. "Alternatively it might be worth while to consider making Spartina silage, particularly as it would probably be some years before the land newly colonized by the plant would be sufficiently consolidated to allow of grazing by heavy stock. Spartina silage might conceivably be better suited for stock than either the green plant or the hay, as a good deal of the salt would probably be expelled during ensiling."

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Fuller details of the topics discussed above will be found in the following publications:—

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(To be continued.)

Direct Sowing for Tree Plantations.—Experiments on a comparatively large scale have been made by the State Forest Service for a number of years to test the possibility of establishing plantations by direct seeding, but the results so far have not been very successful, except in certain pumice areas where the soil conditions are particularly favourable.

MANURIAL TOP-DRESSING OF LUCERNE.

EXPERIMENTS IN CENTRAL OTAGO.

R. B. TENNENT, Fields Superintendent, Dunedin, and A. S. DUFF, Instructor in Agriculture, Alexandra.

IN the spring of 1928 seven lucerne top-dressing experiments were laid down on a co-operative basis with farmers in Central Otago—six on irrigated and one on non-irrigated country. Although, generally speaking, Central Otago soils are of high fertility it was thought that economic increases in yields would be obtained from the application of suitable fertilizers.

As a result of observations made while in California one of the writers was of opinion that fertilizers containing sulphur or sulphur compounds would have a marked effect in increasing the growth of lucerne, particularly on those soils slightly inclined to "alkali" troubles, and this factor was given chief consideration in selecting the types of fertilizers for trial. Experiments in America have conclusively shown that where sulphur compounds are applied to crops growing on alkali soil the toxic effect of the alkali is considerably diminished, and that the application of such fertilizers reflects in a much healthier and more productive crop. Although in Central Otago there do not exist to any extent "alkali" soils typical of those obtaining in other parts of the world, there are, however, in many localities soils with alkali characteristics, and in the case of those it was thought that the application of suitable fertilizers would play an important part.

Quite apart from this aspect of the case it has been shown by independent investigators that plants utilize more sulphur than has been generally supposed. Mr. B. W. Doak, of the Cawthron Institute, who has been working on the question of sulphur in relation to lucerne, has obtained significant increases in yield from the application of sulphur, sulphur compounds, or sulphur-containing fertilizers, and analysis of lucerne-plants obtained from the undermentioned experimental plots showed an increase over the control in sulphur content on those plots top-dressed with sulphur-containing fertilizers.

Table 1.

Manurial Treatment.	Total Green Weight Yield per Acre off Second, Third, and Fourth Cuts.	Sulphur Content.
	Tons.	Per Cent.
Control (no manure)	10·3	0·37
Superphosphate 44-46 per cent., 3 cwt. per acre	15·4	0·44
White Island No. 1 Product, 3 cwt. per acre..	16·5	0·45
Superphosphate 44-46 per cent., 3 cwt., plus White Island No. 1 Product, 3 cwt. per acre	16·8	0·53

NOTE.—The analyses for sulphur content were carried out by the Cawthron Institute.

A typical example of yield increases, better colour of herbage, and corresponding increases in sulphur content from the application of sulphur-containing substances, taken from one of the experiments carried out in Central Otago — that on the property of Mr. R. T. Kinaston, Roxburgh—is given in Table 1.

PLAN OF EXPERIMENTS.

The experiments were designed to ascertain the effects of superphosphate and White Island No. 1 Product, each used individually at the rate of 3 cwt. per acre, and in conjunction with equal quantities at the total rate of 6 cwt. per acre. The plots were laid down on the strip method, control strips without fertilizers being utilized to offset any differences which might result. Altogether there were seven replications of each treatment and eight control strips, each strip being 4 chains long. At harvesting, weighings—of green material in each case — were made of strips ½ chain by 4 ft. 6 in., this resulting in fifty-six weighings being made of each treatment, or a total of 224 weighings from all treatments. The experiments therefore afforded sufficient weighings to allow a statistical examination to be carried out. In all cases the first cut of lucerne was not taken, and this is to be regarded as unfortunate, inasmuch as some striking differences were visible to the eye.

It is of interest to record that White Island Product No. 1 was used in these trials from the point of view that it contains a fair proportion of sulphur. No analysis was made of the actual material applied to the plot in question, but presuming it was the same grade as that used by Mr. Doak in his experiments its sulphur content would be in the vicinity of 21·7 per cent. plus 7·89 per cent. sulphur trioxide. (*N.Z. Journal of Science and Technology*, Vol. xi, No. 1, pp. 25–29, 1929.)

RESULTS OF EXPERIMENTS.

(1) R. T. Kinaston, Roxburgh.

This experiment, conducted on an irrigated five-year-old crop, was laid down on 16th August, 1928. The soil consisted of a good loam overlying a sandy loam and gravel subsoil. The first cut was not weighed, but three subsequent cuts were weighed on the dates given in the following table :—

Table 2.

Treatment.	Second Cut, 4/1/29.		Third Cut, 15/2/29.		Fourth Cut, 4/4/29.		Total Yield per Acre (Three Cuts).
	Yield per Acre.	Increase over Control.	Yield per Acre.	Increase over Control.	Yield per Acre.	Increase over Control.	
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Control (no manure)	3·5	..	4·6	..	2·2	..	10·3
Superphosphate	5·6	2·1	5·8	1·2	4·0	1·8	15·4
White Island Product	5·7	2·2	6·1	1·5	4·7	2·5	16·5
Superphosphate plus White Island Product	5·9	2·4	6·0	1·4	4·9	2·7	16·8

All the increases recorded are significantly better than the control-plot yields. It was quite apparent that the treated plots were in every way superior, this being reflected in better growth and colour. There was little visual difference between the treated plots, although those treated with super plus White Island Product appeared to have the richest appearance and most luxuriant growth.

(2) M. P. McGinnis, Earnscleugh.

This experiment was conducted on a particularly poor soil-type, chiefly composed of gravel and silt with a gravel subsoil. The lucerne-field was three years old, and, being grown under the border method of irrigation, lent itself admirably to even watering. The treatments were applied on 13th August. The first cut was not weighed, although most marked differences were visually observed. Three cuts were subsequently made and weighed, with the following results :—

Table 3.

Treatment.	Second Cut, 1/1/29.		Third Cut, 14/2/29.		Fourth Cut, 18/4/29.		Total Yield per Acre (Three Cuts).
	Yield per Acre.	Increase over Control.	Yield per Acre.	Increase over Control.	Yield per Acre.	Increase over Control.	
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Control (no manure) ..	0·7	..	0·7	..	0·6	..	2·0
Superphosphate ..	2·3	1·6	1·3	0·6	1·2	0·6	4·8
White Island Product	1·9	1·2	1·1	0·4	1·2	0·6	4·2
Superphosphate plus White Island Product	2·6	1·9	1·5	0·8	1·5	0·9	5·6

In this experiment the yields in the second and fourth cuts are averages of fifty-six plots, while the yields in the third cut are averages of forty-eight plots. All increases over control plots are significant. The effect of all treatments was most marked. The control strips were weak and sickly, and in so far as their crop-producing capabilities were concerned could be regarded as a failure. There is thus every indication that by the application of fertilizers in the early growing stages of the crop, success in lucerne-growing can be attained on soils of this nature, which exist in considerable areas in Central Otago.

(3) W. Kloogh, Springvale.

The land upon which this irrigated stand of lucerne is growing is of a light nature, being largely composed of gravel intermixed with a silty soil. At the time the experiment was laid down—4th August—the lucerne stand was five years old. The first and third cuts were not weighed, the latter being too patchy for true results. The reason for this was scanty and uneven irrigation having taken place owing to a break occurring in the main race at the time when this third crop ought to have been thoroughly irrigated. Results are shown in Table 4.

Table 4.

Treatment.	Second Cut, 3/1/29.		Fourth Cut, 8/4/29.		Total Yield per Acre (Two Cuts).
	Yield per Acre.	Increase over Control.	Yield per Acre.	Increase over Control.	
	Tons.	Tons.	Tons.	Tons.	Tons.
Control	6·70	..	4·10	..	10·80
Superphosphate	6·93	0·23	4·20	0·10	11·13
White Island Product ..	6·98	0·28	4·30	0·20	11·18
Superphosphate plus White Island Product	7·00	0·30	4·30	0·20	11·30

In the first cut super plus White Island Product showed the best growth, while super and White Island Product alone were definitely superior to no manure. At the time of cutting the second crop no difference could be seen, except that the control plots were lighter in colour than the treated plots. The increased weights from the super treatments are not statistically significant, but those obtained from White Island Product alone and in conjunction with super are significant. All yields are averages of fifty-six weighings.

(4) W. Noble, Galloway.

This experiment was carried out on a four-year-old irrigated lucerne stand growing on good mica-schist loam with a gravel subsoil. The treatments were applied on 2nd August, and only two cuts were weighed. Details are as follows:—

Table 5.

Treatment.	Third Cut, 29/1/29.		Fourth Cut, 26/3/29.		Total Yield per Acre (Two Cuts).
	Yield per Acre.	Increase over Control.	Yield per Acre.	Increase over Control.	
	Tons.	Tons.	Tons.	Tons.	Tons.
Control (no manure) ..	6·5	..	6·5	..	13·0
Superphosphate	6·9	0·4	6·6	0·1	13·5
White Island Product ..	6·8	0·3	6·6	0·1	13·4
Superphosphate plus White Island Product	6·8	0·3	6·5	..	13·3

In the earlier cuts (not weighed) a slight superiority of the treatments over the control plots was evident, but at the time of the third cutting the only difference discernible was in the colour, which was better on all treated plots. Prior to the fourth cut no difference between treated plots was definitely distinguishable. In the weighings from the third cut the differences of the treated plots from control plots are significant, but this is not so in the weighings relating to the fourth cut. All yields are averages of fifty-six weighings.

(5) Messrs. Towan Bros., Cromwell.

Sown down on a good loam soil with a gravel subsoil, this irrigated five-year-old lucerne stand was in good condition at the date of

top-dressing on 8th August. Only the second cut was weighed—on 2nd February—all subsequent growths being grazed. Results were as under:—

Table 6.

Treatment.	Second Cut, 2/2/29. Yield per Acre.	Increase over Control.
	Tons.	Tons.
Control (no manure)	8·1	..
Superphosphate	8·9	0·8
White Island Product	9·1	1·0
Superphosphate plus White Island Product	9·3	1·2

All treatments were much superior to the control plots, both in growth and colour. The increases over the unmanured plots were significant. All yields are averages of fifty-six weighings.

(6) J. Weaver, Roxburgh.

This particular experiment was carried out on a non-irrigated stand, the manures being sown on 17th August. The soil consists of a medium loam overlying a typical gravel subsoil, the age of the crop at the date of top-dressing being three years. Dry weather during the growing-period of the third crop, and the fact that some stock broke into the plot in the early stages of its growth, resulted in low yields, as shown in the following table:—

Table 7.

Treatment.	Second Cut, 5/1/29.		Third Cut, 16/2/29.		Total Yield (Two Cuts).
	Yield per Acre.	Increase over Control.	Yield per Acre.	Increase over Control.	
	Tons.	Tons.	Tons.	Tons.	Tons.
Control (no manure) ..	5·2	..	1·9	..	7·1
Superphosphate	6·0	0·8	2·1	0·2	8·1
White Island Product ..	5·8	0·6	2·1	0·2	7·9
Superphosphate plus White Island Product	6·1	0·9	2·2	0·3	8·3

The increases recorded are all significant, although the superiority of super plus White Island Product over super is not significant. All manured plots were superior in growth and colour to the untreated plots, the order of superiority being as indicated by the yields. The differences were difficult to detect in the third cut owing to the adverse conditions.

GENERAL CONCLUSIONS: THE EFFECT OF SULPHUR.

From the foregoing experiments, laid down under diverse conditions and under varying methods of irrigation, it is evident that the practice of manuring lucerne in Central Otago must in time, and with benefit, become more general than is at present the case. The evidence afforded points to the fact that superphosphate of the 44–46 per cent.

grade can be regarded as a suitable commercial fertilizer to use, and further indicates that materials, such as White Island Product, containing a fair percentage of sulphur are highly valuable in stimulating the growth of lucerne. The writers are not prepared to discuss the question as to whether the increases recorded from White Island Product are due to straight-out sulphur assimilation—which evidently occurs—or whether they are indirectly due to the effect of sulphur in mitigating the effect of alkali and liberating unavailable phosphates in the soil. Probably all these factors combined have a direct bearing on the results recorded.

These experiments will be carried on for a period of years to see how long the beneficial effects will last, and to ascertain when the various top-dressing treatments require repetition. From the evidence there appears to be every justification in expecting better results where White Island Product, with its comparatively low percentage of sulphur, is replaced by straight-out applications of finely ground pure sulphur. Accordingly experiments are now in hand with the object of obtaining definite data on this point, and the probable beneficial effect of gypsum will be investigated at the same time. It will also in course of time be ascertained from all these experiments whether manuring affects the root-development of lucerne.

The writers wish to place on record their keen appreciation of the able co-operation of the several farmers on whose properties the experiments were carried out.

BOVINE PARTURIENT ECLAMPSIA.

MR. J. LYONS, M.R.C.V.S., Director of the Live-stock Division, makes the following remarks on this subject in his annual report for 1928–29 :—

This disease is still in evidence in a great many dairying districts throughout the country, and considerable loss has been caused thereby. The origin of the disease is somewhat mysterious, and presents a difficult problem to the research workers. Strictly speaking, there is no organic disease. On post-mortem examination nothing abnormal can be observed, and the only assumption that can be arrived at is that the trouble is an absorption of toxins from the intestines or womb, or that it is a lack of some essential element in the system at this particular period. This aspect of the question is being followed up. When making investigation into this complaint one is struck with its similarity to milk-fever. Both these troubles occur in the richer class of country where animals are being well cared for, and many of the symptoms are common to both. So much is this the case that I am satisfied that many cases of milk-fever are mistaken for eclampsia, and on this account treatment is not applied, or, if so, only in a perfunctory manner, as there is a preconceived idea that treatment for the latter trouble is useless, and that fatal results will follow in spite of any treatment that may be applied. In these circumstances I am strongly of opinion that when a cow goes down after calving the customary treatment for milk-fever should be applied in every case. It can do no harm, and in many cases will be the means of restoring the cow to her normal condition. If this treatment is properly carried out (the udder should be inflated until it is tense and hard to the feel), and care is taken to see that the animal is kept in her natural position afterwards, I feel sure that mortality among our dairy stock at this season would be considerably lessened.

NORTHERN WAIROA DEMONSTRATION FARM.

NOTES ON OPERATIONS IN 1928-29 SEASON.

C. J. Hamblyn, B.Agr., Instructor in Agriculture, Whangarei.

In North Auckland the winter of 1928 was characterized by a heavy rainfall, with, however, frequent periods of sunny weather. The early spring rainfall was below the average, but there was plenty of moisture until well into January, when a dry spell was experienced. Good rains from the middle of March onwards provided for an abundant autumn growth.

With continuation of top-dressing, improved drainage, and frequent tripod harrowing the pastures on the Demonstration Farm at Dargaville show a further marked improvement, while the area in permanent grass has been extended. Pennyroyal, buttercup, and docks have practically disappeared from all the older pastures, and rushes are much less troublesome. Basic slag is being used as the main phosphatic fertilizer for top-dressing, and is giving good results. In order to demonstrate that with the ordinary annual application of from 3 cwt. to 4 cwt. of phosphate per annum farmers of the district were not likely to be wasting fertilizer through an oversupply; one paddock was given 6 cwt. of basic slag per acre. This paddock was outstanding throughout the season, both in regard to colour and density of the sward, and was always preferred by the stock.

The area in crops was reduced to 3 acres of soft turnips, which were fed out from the end of January to the middle of April. Soft turnips as supplementary feeding for this period are being replaced by silage made from excess pasture growth in November and December. With the extension of the area under pasture and the adoption of rotational grazing the position in regard to the provision of adequate supplies of hay and silage is gradually being improved. Three paddocks cut for hay, including a 6-acre temporary pasture of Italian rye-grass and red clover, yielded about 30 tons of winter feed, and one paddock made into silage provided 20 tons. Half of the latter was not required during the past winter, and is being kept for supplementary feed from next January on.

The butterfat production of the farm was again affected to a marked extent by late calving owing to temporary sterility, and by an outbreak of mammitis. An increase of 690 lb. butterfat over the production for the previous season was due mainly to improved pastures and better pasture management and utilization. The position with regard to late calving is gradually improving with careful herd-management, and mammitis has decreased.

MOLE DRAINAGE.

During the past two seasons several fields on the farm have been mole-drained in order to study the effectiveness of this type of drainage under the conditions obtaining on the heavy, flat alluvial land in the Northern Wairoa district. The large area of flat alluvial land, about 120,000 acres in extent, stretching from Kirikopuni to Ruawai has

been built up of fine clayey material deposited in the tidal reaches of the Northern Wairoa River. This land is difficult to drain, and is subject to bad poaching by stock when wet. There are naturally many variations in texture, according to the proportion of very fine clay in the soil and variation in the depth of black soil overlying the clay subsoil—indicated by different types of natural cover, such as flax and manuka, raupo, kahikatea, puriri, and cabbage-tree—and in the main the drainage problem is closely related to the nearness to the surface of the clay subsoil and to the texture of the clay. Efficient drainage is definitely the first and chief requirement in the successful establishment of pastures on these soils.

By means of Drainage Boards and drainage areas more or less effective systems of main-outlet drains have been put in as a basis for individual farm drainage by means of open drains. Where such farm drains were put in before there was much heavy stocking of the land, and where they are deep and the water gets away rapidly to the outlets, a complete system of them, together with small paddocks, is fairly effective in keeping the land dry in the winter, but there are always portions of the paddocks from which the surface water is not removed quickly enough to allow of stocking. Deep and numerous open drains, however, are objectionable in that there is definite over-drainage in the summer, and the cleaning and maintenance is difficult and costly.

Thorough drainage—which means the maintaining of the water-level sufficiently below the surface to rapidly remove the extremely harmful excess water resulting from heavy winter rains, at the same time keeping the level of the water within reach of the roots of pasture plants as long as possible during dry weather—can be secured only by combining a system of comparatively shallow open drains leading into an effective outlet drain to carry off the flood waters, with a system of underground drainage to remove the water rapidly from the surface of each paddock and lead it out into the open drains. With such a system of drainage pastures are earlier, fertilizers and harrowing more effective, there is no poaching of the surface, and weeds such as pennyroyal, buttercup, and rushes are suppressed; also the stock are comparatively dry underfoot even in wet weather, while the effect of droughts in drying out the pastures is considerably reduced.

For thorough drainage tiles are undoubtedly the best, while very effective drains can be constructed by using manuka fascines or timber slabs to make a passage-way for the water at the bottom of the drains after they are filled in. All these methods, although fairly permanent if well carried out, are slow and require a great deal of labour, and, in the case of tiles, the use of expensive material. It is estimated that in the Northern Wairoa district a system of tile drains 1 chain apart costs on an average from £7 10s. to £10 per acre. In view of the fact that an effective system of mole drains 9 ft. to 11 ft. apart can be put in, where conditions are suitable, for from 7s. to 10s. per acre, experimental work with this method has been carried out on the Demonstration Farm.

The best type of mole plough consists of a beam of angle-iron from 6 ft. to 8 ft. long with a skid at the front and a heavy blade fitted at

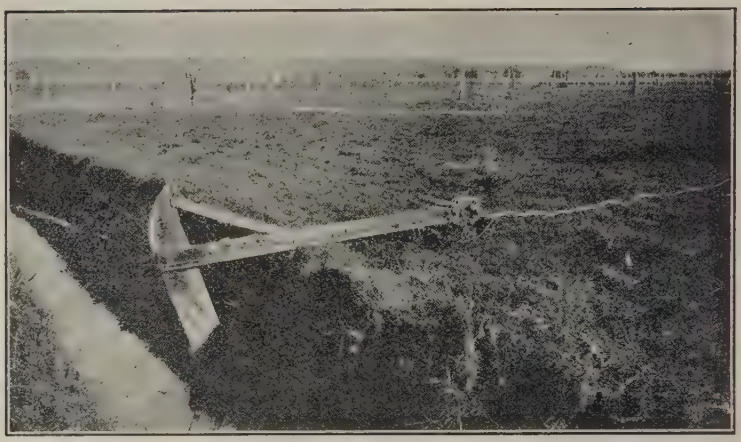

FIG. 1. MOLE PLOUGH ENTERING SIDE OF OPEN DRAIN AT THE DEMONSTRATION FARM.
Note adjustable bar from middle of beam to top of blade to regulate depth.

FIG 2. PLOUGH IN ACTION, TRACTOR-DRAWN.

FIG. 3. PLOUGH EMERGED FROM GROUND BY SELF-LIFTING ACTION.
At end of paddock the bar is tripped and plough lifts.

the back, and with the torpedo and ball or cone attached to the foot of the blade. The blade is adjustable to allow for alterations in depth. This type of plough has superseded the older heavy types of sledge or wheeled mole ploughs, and has the advantage of being easily handled; with the skid at the front of the beam and a long chain, any slight inequalities in the ground, such as lumps and hollows, do not affect the general level at which the mole is drawn. Six to eight horses or a tractor are necessary to draw the plough through the stiffer soils.

FIG 4. PLOUGH IN TRANSPORT POSITION, RETURNING TO OPEN DRAIN.

Note spring hitch near head of plough—very necessary where occasional stumps occur.

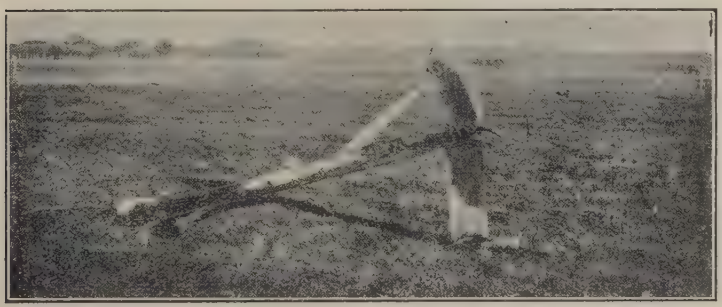

FIG. 5. PLOUGH SET UP TO ENTER GROUND FROM SURFACE.

Here the implement is about to draw mole-drains across a hollow where later a covered drain will be made. Mole enters ground to required depth after being pulled a few feet.

For successful mole-draining there must be a fall, however slight, to the outlet drain from which the moles are to commence, and the land must have a suitable clay subsoil in which the mole is to be made, and be fairly free from underground stumps and logs or other obstructions. A fall can be secured where necessary by gradually altering the depth of the mole. The plough being set at the required depth, the blade is placed in the open outlet drain and the plough drawn to the far side of the field. On arrival at the end of the mole drain the working of a trip-lever brings the plough out of the ground.

The plough is then brought back to the outlet drain, and set in again 9 ft. to 11 ft. from the opening of the last mole drain.

Where there is no suitable open drain for an outlet, but a definite hollow occurs through the field, the moles can be made to cross the hollow by setting the plough up at one side of the paddock, drawing it across the depression, and lifting it at the other. With a plough that will enter the ground from the surface and is self-lifting this is easy to do. An open drain is then made crossing the moles, and this can be made into a covered drain to provide an outlet for the moles. Where the outlet of the mole drains is into an open drain the sides of which tend to crumble or become overgrown, a 2 in. or 2½ in. tile should be inserted in the end of each mole and allowed to project slightly into the open drain. This will prevent one of the chief difficulties of mole drainage—the gradual blockage of the outlets.

The best depth at which to draw the moles depends on the type of subsoil, but an average of from 16 in. to 18 in. is recommended, and shallower where the subsoil is very stiff. A mole of 2½ in. diameter is quite effective in most soils, and the draught is easier than for bigger moles, which have little advantage. As regards the distance apart of the mole drains, this again depends on the texture of the subsoil, the general average being from 9 ft. to 11 ft. on fairly stiff land, and wider where the soil is freer. The stiffer and more sticky the subsoil the longer will the moles last, while they are practically useless on free silts or sandy soils.

The results of mole drainage on the Demonstration Farm are promising, in that parts of paddocks, and in places whole paddocks, where heavy stocking during the winter resulted in bad poaching, were kept quite dry, with a consequent rapid thickening of the pasture sward and improvement in growth. In conjunction with the present systems of open drains, a great deal of pasture-land on farms in the Northern Wairoa could be efficiently drained by the mole plough, the use of which, however, in some cases is limited by the presence of roots and logs in the ground.

PASTURE EXPERIMENTAL WORK.

With further subdivision on the farm, a system of rotational grazing was put into operation during the season. A good supply of hay and soft turnips for late autumn and winter feeding allowed for the closing of 12 acres of grass at the end of May to provide an early bite for the first calvers, while a paddock top-dressed in July with 1 cwt. of sulphate of ammonia per acre gave useful grazing at the end of August, by which time the rotation was in full swing. As already mentioned, soft turnips are now being replaced by silage. A more intensive system of grazing is gradually being developed.

Two 3-acre paddocks—both of which had been phosphated—were used in a nitrogen top-dressing experiment. The application of 1 cwt. of sulphate of ammonia per acre in July to one of the paddocks gave a strong dark-green growth, which was ready for grazing two weeks earlier than the pasture of the adjoining paddock which did not have the nitrogen dressing. Of three later dressings with 1 cwt. of sulphate of ammonia, applied on 18th October, 22nd December, and

18th March last respectively, the latter was the only one to show an advantage as regards quickness and type of pasture-growth.

A comprehensive set of observational trials with various types of fertilizers was put down on three representative pastures in June last. These fertilizers include superphosphate, basic slag, North African phosphate, sulphate of ammonia, 30 per cent. potash salts, Diammonphos, and Nitrophoska, and include various combinations of these manures with and without lime. The plots will be continued over a number of years, the idea being that from continuous observation under normal grazing-conditions indications will be given by the plots as a guide to general top-dressing.

MISCELLANEOUS.

A start has been made with the provision of shelter-belts and shade clumps, this work having been delayed until the drains and fence-lines on the farm were definitely fixed. For north-and-south belts on the flats Bentham's cypress is being used in preference to Lawson's cypress, as being more suited to clay soils. The east-and-west belts are being planted with pampas-grass, which thrives along the drain-sides and does not shade the paddocks, but gives complete shelter from cold winds, at the same time eliminating a great deal of drain-cleaning and the crumbling of the sides of drains. For shade clumps weeping-willows are planted where springs occur, and eucalypts in odd corners.

Several well-attended field-days were held during the year in connection with rotational grazing, ensilage-making, and mole drainage.

Moisture and Protein Tests of Wheat. — In the course of a report on the past year's operations of the Wheat Research Institute, the Director (Dr. F. W. Hilgendorf) states: "Good progress has been made with moisture and protein tests. Owing to an extremely favourable harvesting season, it was possible to use the combine thresher in a number of Canterbury crops. Tests of this grain compared very favourably in regard to their moisture content with others made with grain secured from threshing-mills, but, on account of the exceptionally good weather prevailing, these results must be accepted with caution. In the protein survey very wide divergences in the protein content have been observed; and it has been found that in some instances a variety such as Tuscan, which is usually considered as being low in protein, is capable of approximating even Pearl in this respect. It is premature yet to base any conclusions on the work already completed, but the preliminary investigations indicate that systematic work on these lines will be productive of real economic advantage to the wheat industry."

Lice-infested Sheep.—Referring to this matter in his annual report for 1928–29, the Director of the Live-stock Division (Mr. J. Lyons) states: "Taking the position right through the Dominion as a whole there has been a slight improvement. However, there are still far too many sheep affected with lice being exposed in the saleyards. In the Auckland district there has been an increase in the number noted. To some extent this may have been caused by the lack of water which was in evidence during the dipping-period. The chief offenders are those on small farms carrying a comparatively small number of sheep as a side-line. I would again draw the attention of all owners to the fact that when sheep affected with lice are found in the saleyards the provisions of the Act will be enforced in all cases."

BOYS AND GIRLS' AGRICULTURAL CLUBS.

TARANAKI AND WELLINGTON DISTRICT COMPETITIONS, SEASON 1928–29.

J. M. SMITH, Instructor in Agriculture, New Plymouth.

THE year 1928–29 recorded another very successful season in the boys and girls' agricultural club work, with a further increase in entries and an extension in the area covered, so far as the Taranaki and Wellington Provincial Districts are concerned. Till the previous season the work was confined to North and South Taranaki and the Wanganui and Feilding localities chiefly, but during the past year there has been additional club activity in the Taihape, Hunterville, and Wairarapa districts. Over all of these districts the total number of competitors, including both crop-growing and calf-rearing, was in the vicinity of 1,500. Competitions were on lines similar to those of previous seasons—that is, crop-growing in all districts, with calf-rearing in both North and South Taranaki and at Waverley.

CALF-REARING.

The number of calves judged in Taranaki during the past three seasons is as follows:—

	1926–27.	1927–28.	1928–29.
North Taranaki	117	154	215
South Taranaki	283	344	311

The group in the Waverley district embraces just the Waverley and surrounding schools, and is conducted by the local branch of the Farmers' Union.

Further improvement in the condition of the calves brought forward for judging was noted, although, as is only to be expected at this stage after several seasons' work, the improvement is not so marked as it was during the first season or so. The actual handling of the calves leaves much to be desired in some districts, and competitors would be well advised to pay more attention to this phase of the competition. Judging was again carried out on lines similar to those of previous seasons, the first judging being done at the respective schools and the winning animals then being brought forward to a selected centre for championship judging. The two classes for "light" (Jersey-Ayrshire) and "heavy" (Shorthorn-Friesian) breeds were adhered to, as in the past.

Judging was carried out during the latter part of November and early December, 1928. There were two distinct competitions, one for dairying condition or rearing and the other for type. In the condition competition the judges are asked to avoid awarding prizes to animals carrying undue superfluous flesh, but to interpret condition as meaning a well-reared, bright, healthy calf in what one would term milking condition. The judges were farmers selected for their judging ability as well as having that desired quality of demonstrating to the competitors what they should strive for.

Advantage was taken of the championship judging in North Taranaki to hold a general field-day for the competitors. Besides the actual

FIG. 1. TRANSPORT OF PARTY OF COMPETITORS AND THEIR CALVES BY MOTOR-LORRY TO CHAMPIONSHIP JUDGING CENTRE AT ELTHAM, TARANAKI.

FIG. 2. SOME CALF-CLUB COMPETITORS AND THEIR ENTRIES AT THE CHAMPIONSHIP JUDGING, ELTHAM.

judging of the calves for championship points, demonstrations were given on various breeds, and addresses delivered on calf-rearing and similar subjects, while a cow-judging competition was also conducted.

With a view to continuity the competitors are encouraged to bring animals previously judged for further judging, and during the season a large number of animals, ranging from yearlings to four-year olds, were presented in this way.

In North Taranaki the championship for the Jersey-Ayrshire class was won by Muriel Schreiber, Waitui, and in the Friesian-Shorthorn class the championship went to Maisie Rea, Omata. The champion dairy-type Jersey-Ayrshire heifer was reared by Leslie Hodson, Tikorangi, while the corresponding championship in the Friesian Shorthorn class went to Eileen O'Byrne, Egmont Village. In South Taranaki the championship for condition in the Jersey-Ayrshire class was won by Norma Walker, Okaiawa, while Gladys Taylor, Fraser Road, won in the Friesian Shorthorn class. The dairy type championship in the Jersey-Ayrshire class in this district was won by K. Laird, Mata, and that for the Friesian-Shorthorn class by Helen Nicholls, Otakeho.

CROP-GROWING.

The entries judged in the various districts were as follows: North Taranaki, 154; South Taranaki, 117; Wanganui, 138; Feilding, 204; Wairarapa, 126; Taihape, 65; Marton-Hunterville, 94.

The following crops were grown: North Taranaki, mangels and chou moellier; South Taranaki, mangels and carrots; Wanganui, mangels and carrots; Feilding, mangels and maize; Wairarapa, mangels; Taihape, mangels and carrots; Marton-Hunterville, mangels and carrots.

Seasonal conditions were fairly good for cropping, and some very fine yields were recorded. In North Taranaki two varieties of mangels were again grown, and this added interest to the competition, besides being a valuable factor in determining the best varieties to grow in the different districts. The varieties grown were Prizewinner and Red Intermediate.

It is pleasing to note that the number of crops dropping out of the competitions each season is gradually being reduced, although there is still ample room for improvement in this respect. Sowing of the seed too deep is responsible for a number of initial failures, while pests also take toll of the crops. The greatest factor in the elimination of entries is through stock breaking into the plot and destroying it. Fortunately, however, the number of failures from sheer neglect is small.

The outstanding success of the year in the districts under review was the crop of mangels grown by George Loving, of Huinga, which weighed out at the rate of 181 tons 5 cwt. per acre, and just missed winning the Stuart Wilson Cup for the 1928-29 season. The Barres Stryno mangel grown in South Taranaki this season was very successful, the variety, generally speaking, yielding very well. It is a good show mangel, and drew forth much favourable comment at the various shows where displays were made.

The results for the championship and the average yields were as follows :—

North Taranaki :

	Tons	cwt.
Mangels :		
1st, V. Penwarden, Tataraimaka	119	4
2nd, G. Beaven, Tikorangi	112	0
3rd, B. Beaven, Tikorangi	101	16
District average	56	10
Chou moellier :		
1st, C. Watson, Huirangi	71	13
2nd, E. Corlett, Ratapiko	50	5
3rd, E. Zimmerman, Kaimero	45	9
District average	30	13

Best-kept plot : Stanley Cloke, Lepperton.

South Taranaki

Mangels (Barres Stryno) :		
1st, Geo. Loving, Huinga	181	5
2nd, Gladys Taylor, Fraser Road	138	17
3rd, Jack Nichol, Toko	110	17
District average	72	0
Carrots (Matchless White) :		
1st, H. Goblin, Ararata	59	12
2nd, G. Lundberg, Ararata	59	6
3rd, R. Anderson, Toko	59	9
District average	42	1

Best-kept plot : R. Anderson, Toko.

Wanganui :—

Mangels :		
1st, Lily Powell, Kohi	149	15
2nd, C. McCandlish, Ngaturi	139	13
3rd, Alison McCandlish, Ngaturi	132	15
District average	64	0
Carrots :		
1st, Alison McCandlish, Ngaturi	77	2
2nd, Nora Munro, Ngaturi	77	2
3rd, Lily Powell, Kohi	72	0
District average	40	0

Feilding :

Mangels :		
1st, D. Meehan, Longburn	121	6
2nd, S. Spring, Moutoa	114	2
3rd, R. Hill, Rongotea	111	13
District average	56	2
Maize :	Bushels.	
1st, Doug. Jansen, Kiwitea	66·4	
2nd, H. Jakobsen, Taonui	65·2	
3rd, Mona Christensen, Oroua Downs	8[illegible]·1	
District average	42	

Wairarapa :—

	Tons	cwt.
Mangels (Prizewinner) :		
1st, Rod Percy, Te Oro Oro	105	18
2nd, Alex. Hart, Te Whiti	99	13
3rd, Ron McGovern, Mauriceville	87	2
District average	41	1

Taihape :—

Mangels (Red Intermediate) :		
1st, Phil. Klat, Manganoho	135	12
2nd, Avis Prime, Ohutu	83	12
3rd, Hugh Dallas, Otamakapua	75	10
District average	55	0
Carrots (Matchless White) :		
1st, Lloyd Rowe, Mangaonoho	68	2
2nd, Lily Bielski, Karewarewa	61	17
3rd, Winifred Dellow, Utiku	34	12
District average	47	0

It will be noticed that in some cases the weight figures do not coincide with the placings, but in these cases the differences were brought about by a difference with some other marks, probably for chart.

Exhibitions of roots grown by competitors were again staged at the Wanganui, Hawera, New Plymouth, and Wellington winter shows. The Henry Lane and Co. Dominion challenge shield for the greatest number of points in club work was won by Ararata School, in South Taranaki.

FIG. 3. EXHIBIT OF ROOTS FROM PRIZE-WINNING CROPS AT WELLINGTON WINTER SHOW, 1929.
The Stuart Wilson Cup is seen in centre.

Senior Clubs.

This was the third season of work with the senior clubs. The difficulty with this intermediate competition is to get in touch with the competitors again after their secondary education is completed. Many of the junior competitors on leaving the primary school go to live in the nearest town where a secondary school is situated, thus in a way breaking touch with the country. However, plans are in train whereby organizers of this branch of the competitions will be able to get in direct touch with those going back to the farms, and it is hoped that entries will then increase. In North Taranaki the senior competition was with mangels (Prizewinner) and in South Taranaki with mangels and carrots. In North Taranaki a further manurial trial was conducted, the manures under trial and the results being as follows :—

	Tons	cwt.
Basic manure (super 3 parts, bone 1 part, Nauru phosphate 1 part)	68	13
Basic manure plus muriate of potash	69	12
Basic manure plus 30 per cent. potash	57	13
Basic manure plus kainit	50	14

The competition winners were as follows :—

North Taranaki :—

	Tons	cwt.
Mangels :		
1st, D. Muir, Brixton	82	12
2nd, L. Corlett, Ratapiko	76	2
3rd, J. Corlett, Ratapiko	58	11

South Taranaki :—

Mangels :		
1st, Ron Taylor, Fraser Road	95	5
2nd, Geo. Feather, Kokiri Road	70	3
3rd, Lloyd Walker, Otakeho	66	4
Carrots :		
1st, Harry Feather, Kokiri Road	47	5
2nd, D. Campbell, Otakeho	41	15

As in past years, the co-operation between teachers, parents, supervisors, instructors, and competitors has gone a long way towards the success of the movement, and thanks are due to all helpers and donors of prizes.

AWARD OF STUART WILSON CUP FOR 1928–29 SEASON.

THE cup presented by Mr. W. Stuart Wilson, of Wellington, for annual competition among boys and girls' agricultural clubs was won this year by Dudley Tayles, of East Gore School, Southland, with an outstanding crop of potatoes yielding at the rate of 31¼ tons per acre. The runner-up was George Loving, Huinga School, South Taranaki, who grew a crop of mangels which weighed out at the remarkable rate of 181 tons 5 cwt. per acre. For the purposes of comparing these two crops it was considered necessary to take into consideration their value, and on the basis of the current values at the time of judging the potato crop was worth £156 and the mangels £135 15s. per acre.

In accordance with previous practice the Department of Agriculture has presented Dudley Tayles with a gold medal and a photograph of the cup as a permanent record of his win.

GOVERNMENT ASSISTANCE TO THE CLUB MOVEMENT.

THE Department of Agriculture and the Education Department have lately been giving close consideration to the question of reorganizing the control of boys' and girls' agricultural clubs and of granting further assistance to them. The Minister of Agriculture (Hon. G. W. Forbes) recently approved of a scheme of control and assistance of which the following are the main points : (1) Where any approved district organization is set up to develop the club movement the Department of Agriculture will subsidize any funds that such organizations may collect, up to a maximum of £40 ; not more than two such organizations to be subsidized in any one Education Board district ; the Department to have the right to appoint the chairman of any of the organizations that are subsidized. (2) The Department to provide the seeds and manures necessary for the clubs that are formed. (3) The Department to supply all charts and certificates in connection with the work. (4) All possible assistance to be rendered to the organizations set up.

STERILIZATION OF DAIRY APPARATUS.

LIVE STEAM EFFICIENCY TEST AT WALLACEVILLE.

G. F. V. MORGAN, N.D.A., N.D.D., Dairy Bacteriologist, Wallaceville Laboratory

A TEST was recently carried out at the Wallaceville Laboratory regarding the efficiency of steam sterilization of dairy apparatus by a "Cleena-Milk" outfit (Barford and Perkins) recently imported from England. For the purpose of the test, arrangements were made for the use for one week of all detachable parts of the milking-machine of a dairy-farmer located near the Laboratory. During this time all parts of his plant, except two lengths of milk-pipe which were not readily detachable, were sterilized for half an hour at boiling-point. It was found necessary to omit the cooler after the second day, as disconnecting it gave a good deal of trouble (Figs. 1 and 2, page 340).

All parts of the plant stood sterilization extremely well; teat-cup rubbers and all sound rubber parts of the plant remained unchanged. Rubber connections between the teat-cups and milk and air pipes, already nearly perished, became sticky and plastic after the first sterilization: these were rejected and new rubbers of the same type put on. These remained unchanged after sterilization.

The original bacterial count of this farmer's milk was taken into consideration, as he appeared to be running his plant in a cleanly manner. Four samples of milk were taken from the plant before sterilization was commenced, and gave the following counts of organisms per cubic centimeter: No. 1, 2,256,000; No. 2, 2,912,000; No. 3, 4,480,000; No. 4, uncountable. *Bacillus coli* was present in each sample.

The plant was taken down after the morning's milking, cleaned, and then sterilized for half an hour at boiling-point. After each sterilization the various parts of the plant were washed with known quantities of sterilized water, care being taken to prevent recontamination from the atmosphere. The following quantities of sterilized water were used for washing: Cooler, 1,000 c.c.; cooler-tank, 1,000 c.c.; downpipes (three), 500 c.c. each; teat-cups, 1,000 c.c. between three sets; releaser, 1,000 c.c.; can, 1,000 c.c.

Samples were then taken from this water after it had been carefully passed over all surfaces of the part treated, and cultured on standard agar by the shake-culture method. The findings in three-day cultures for all six series are given in the following table:—

Results from Cultures of Washing-water Samples.

Apparatus.	Growth.	Presumptive Bacterial Count.
	First Day.	
Cooler	One colony.. ..	1,000 organisms.
Cooler-tank	Two colonies ..	2,000 organisms.
Pipe 1	Six colonies ..	3,000 organisms.
Pipe 2	No growth	..
Pipe 3	No growth	..
Teat-cups	No growth ..	..
Releaser	One colony ..	1,000 organisms.
Can	One colony.. ..	1,000 organisms.

Results from Cultures of Washing-water Samples—continued.

Apparatus.	Growth.	Presumptive Bacterial Count.
	Second Day.	
Cooler	No growth	..
Cooler-tank	One colony	1,000 organisms.
Pipe 1	No growth	..
Pipe 2	No growth	..
Pipe 3	No growth	..
Teat-cups	No growth	..
Releaser	One colony	1,000 organisms.
	Third Day.	
Cooler	No growth	..
Cooler-tank	No growth	..
Pipe 1	No growth	..
Pipe 2	No growth	..
Pipe 3	No growth	..
Teat-cups	No growth	..
Releaser	No growth	..
	Fourth Day.	
Cooler (omitted)	..	..
Cooler-tank	No growth	..
Pipe 1	No growth	..
Pipe 2	One colony	500 organisms.
Pipe 3	No growth	..
Teat-cups	No growth	..
Releaser	One colony	1,000 organisms.
	Fifth Day.	
Cooler (omitted)	..	..
Cooler-tank	No growth	..
Pipe 1	No growth	..
Pipe 2	One colony	500 organisms.
Pipe 3	No growth	..
Teat-cups	No growth	..
Releaser	No growth	..
	Sixth Day.	
Cooler (omitted)	..	..
Cooler-tank	No growth	..
Pipe 1	No growth	..
Pipe 2	No growth	..
Pipe 3	No growth	..
Teat-cups	No growth	..
Releaser	No growth	..

NOTE.—*Bacillus coli* was absent in all the above counts.

These results give highly satisfactory evidence of the efficiency of steam sterilization for half an hour at boiling-point.

The quantity of coal used in the boiler at Wallaceville for generating steam and holding the "Cleena-milk" chest at boiling-point for half an hour amounted to only 25 lb. daily, costing 9¾d., or £14 16s. per annum. The boiler at Wallaceville is much larger than is necessary for heating the steam-chest only, as it is required for the pasteurizer in the experimental dairy. Boilers supplied by the manufacturers of these outfits are much smaller and lighter in design, and would burn less coal, educing the annual cost of running still further.

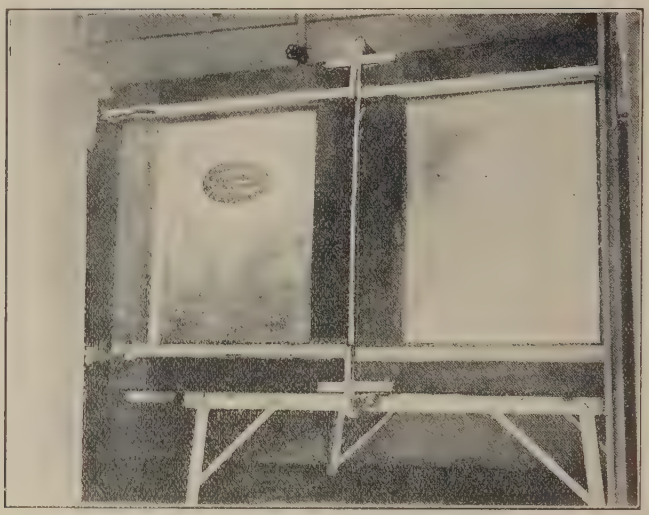

FIG. 1. THE "CLEENA-MILK" STERILIZING-CHEST AT WALLACEVILLE LABORATORY

FIG. 2. CHEST OPEN, SHOWING APPARATUS PLACED FOR STERILIZING.

The types of organisms found present on the agar plates that would appear to have escaped sterilization were subcultured and examined under the microscope. Of these organisms three were spore-forming aerobes, two of which were *B. subtilis*, one rough and one smooth type; one a colony of *Sarcinae;* several cocci-forming, very viscous colonies, with marked acidity production on lactose agar; and two colonies of gelatine-liquefying cocci. Further experiments for determining the exact thermal death-point of these organisms are now being carried out.

SEASONAL NOTES.

THE FARM.

THE PASTURES.

WEATHER conditions having made the current season a late one, the difficulties of properly controlling pasture growth have not presented themselves this year as soon as is usual, but it is probable that before midsummer arrives many farmers will have on hand surplus pasture growth which they can deal with most advantageously only by resorting to ensilage-production.

The farmer has no occasion to make ensilage-production a rival or an alternative to hay-production: that is to say, it is not a question whether he should make ensilage rather than hay, or whether he should make ensilage only if there is a surplus growth after adequate areas have been reserved for the hay supply considered necessary if ensilage is not taken into account at all. Often there is excellent scope for the production of both hay and ensilage, and if both are produced a feature of good management is introduced in that the labour of handling the pasture surplus is spread over a longer period, and is thereby likely to be made less disturbing to routine farm-work. In favour of making some ensilage instead of hay only are the following considerations:—

(1) The ensilage-production, being independent of weather conditions, can be attended to at the time proper to the welfare of the pasture growth, whereas if one waits for good haymaking weather it is often impossible to carry out the earlier mowing which suits the pasture, and which allows of the development, before the dry midsummer weather arrives, of the second growth, or aftermath, that is so valuable as a source of fresh young forage which it is somewhat difficult to secure otherwise at that season.

(2) A supply of ensilage is advantageous in that it can be used with good results, should a period of shortage occur, as a summer forage for dairy cows, whereas had the nutriment been stored away as hay it could not be so used.

Topping the pastures by running the mower over them when they show signs of producing seed-stalks is at times carried out too late to obtain from the practice the greatest possible benefits. A paddock topped early in December should be supplying at New Year considerable fresh leafy forage, which it would not produce were the topping not carried out at the right time. The necessity for topping of pastures is specially likely to arise principally on two types of farms—those on which there is not an adequate number of dry stock to follow the stock in milk and clean up growth which it does not prove advantageous to force the wet stock to consume; and, secondly, those farms on which harrowing of pastures does not receive adequate attention, and on which it is most difficult to keep closely grazed the growth which comes in patches in the vicinity of the undisturbed droppings.

Harrowing of pastures to break up and scatter the droppings is often highly desirable during December. In doing this work results obtained by harrowing first in one direction over a paddock, and then, at right angles to the first harrowing, across the paddock, are far better than the results obtained by putting in the same amount of labour harrowing round and round a paddock in the one direction. Harrowing of pastures during December or thereabouts specially calls for attention, because when a dry spell comes, even though a considerable number of

droppings has accumulated, it may not be possible to harrow with advantage on account of the soiling of the pasture which may result, and which can be removed satisfactorily only by rain.

FORAGE-CROP CONSIDERATIONS.

At this season of the year probably the most neglected aspect of forage-crop production is that of cultivation. This applies both to crops which are yet to be sown and to those the seedlings of which are already above the ground. Cultivation seems to be looked upon by some merely as a means of keeping weeds in check, and hence as a matter calling for action only when the weeds are becoming a nuisance. As a matter of fact, weed-control is only one of the several important objects of cultivating land, both before and after the crops have become established. The value of the cultivation which produces a good seed-bed is generally recognized, even though some at times, judged by their practice, seem to overlook the necessity for a good seed-bed. But the value of the cultivation after the sowing of the seed is not so generally understood, and hence this cultivation work is more neglected than is the cultivation needed to produce a suitable seed-bed. The position, summed up, is that, apart altogether from weeds, a growing crop in ground badly cultivated cannot obtain the full benefits from quality in seeds, and from the free use of high-class manures; and, further, if a spell of dry weather occurs, such a crop is apt to suffer from an inadequate supply of soil-moisture which suitable surface cultivation would help one to avoid. Hence intertillage of growing crops sown in rows wide enough to allow of it is highly desirable, even though weeds are not disagreeably prominent.

Often in December, hand-in-hand with tillage between the rows, goes the work of thinning and weeding of crops sown in October or November—work which is made easier and more effective by prior hoeing along the rows.

Thinning, though seldom completely neglected, is often so delayed that the plants which remain after thinning have been seriously and permanently weakened by their struggle with the plants which have been removed. Undue delay in thinning not only injures the crop, but also makes the work of thinning more difficult. The best time to do thinning is as soon as the seedlings are of sufficient size to allow of the plants being handled without too much difficulty. The weeding which accompanies such early thinning enables weed seedlings freely to be destroyed at their most tender delicate stage.

During December work which will require attention on many farms will be the sowing of such crops as swedes, soft turnips, and rape. In connection with such sowing, seed injury is apt to occur if the seed is placed in the soil adjacent to any considerable amount of superphosphate, and the amount of injury is likely to become of moment when a dressing of superphosphate in excess of 1 cwt. an acre is so used. Injury may be avoided by using a slower-acting manure such as basic super, or a mixture of carbonate of lime and superphosphate in equal proportions. Further, the fairly common practice of mixing seeds of the above-mentioned crops with manure prior to sowing is likely to result in a field germination failure if the manure happens to be superphosphate and the seed has been lying mixed with it even for a relatively short period, such as two or three hours. Such mixing, however, can be safely carried out with phosphatic manures which are not soluble in water, such as Ephos, basic super, &c.

HAYMAKING.

Grass growth to be made into hay is very often cut at a stage too mature to allow of the production of hay of the best possible quality. The growth is allowed to become overmature because of two main facts. The first of

these is that when the growth is at the stage best suited for mowing, so as to produce hay of the highest possible quality, the weather is not at all suitable for haymaking; the farmer makes what he considers the best choice under the circumstances by waiting until he can expect good weather and so losing not only quality in his hay, but his chance of getting the plentiful aftermath on the hay-paddock which the earlier mowing would tend to secure. The other fact which operates against earlier mowing for hay is that many do not fully realize the advantages to be gained by mowing, when weather allows, much earlier than is often done; they do not realize that the changes which occur in plants after they have reached their early flowering stages reduce rather than increase the value of the crop from the hay standpoint, in that the digestibility of the forage is seriously impaired without effecting any material increase in the weight of nutriment.

Should a period of bad weather be experienced immediately after an area is mown it is good practice to leave it, within reason, undisturbed completely until it is felt that the weather has again picked up, for any handling that the mown material receives makes it more subject to washing-out of the valuable nutriment that it contains, should rain follow. Again, when bad weather may be expected it is often good practice to hurry to get the green material into the cocked stage, for when in cocks the material does not suffer so much washing-out of nutriment as would the same material if scattered over the whole field.

Especially when an early saving of the hay crop has been effected, good results are obtainable by top-dressing the field immediately after the removal of the hay, in order to stimulate the quick development of the subsequent grass growth. For this top-dressing superphosphate generally proves excellent.

MISCELLANEOUS.

During December on many farms butterfat-production will be found to be falling at an unduly fast rate. This occurs although there is still plenty of grass growth available, and is due to the fact that much of such growth is too mature to serve as high-class feed for animals of heavy production. The position will be relieved if the pasture-topping already mentioned has been carried out, or if suitable young forage such as a second growth on a lucerne-field is available to supplement the pastures. The essential feature, often overlooked, of such forage is that it be relatively free from fibre or woodiness, and therefore young and leafy. Maturer forage-crop material is not superior to the pasture growth itself, and, if available, should be made into hay or ensilage.

Attention should be given in good time to ensuring that all harvesting requisites will be available when required. This applies particularly to the reaper-and-binder and to the mower. In regard to these, the replacement of worn-out parts is often just as advisable as the replacement of broken parts, and the replacement in either case usually calls for considerable time which can ill be afforded when harvesting is actually in progress.

—R. P. Connell, M.A., Fields Division, Palmerston North.

PREVENTIVE MEASURES AGAINST LYMPH-ADENITIS IN SHEEP.

In the *Journal* for January last an outline was given of the disease known as caseous lymph-adenitis in sheep, with particular reference to its nature and the preventive methods to be used in order to limit its occurrence as far as possible. Now that the authorities in Britain are paying special attention to the discovery of this disease in imported mutton and lamb carcasses, including the thawing-out of a certain percentage of these, it is imperative that every endeavour be made to

prevent as far as possible any affected carcasses reaching the overseas market. The Department of Agriculture is accordingly strengthening its meat-inspection staff to this end, and extreme vigilance will be observed at freezing-works. But in addition to this, and in order that the very moderate incidence of the disease in New Zealand may be reduced, with a view to its eventual elimination, the co-operation of all sheep-farmers is essential.

At the Department's Veterinary Laboratory experimental work in this disease showed that the chief means by which the disease is transmitted is the entrance of the causal organism through wounds or abrasions of the skin. It is therefore obvious that wounds incurred during the operations of castration, docking, shearing, crutching, &c., are all sources by which the germ may gain entrance and set up the disease.

All blades used in shearing should be sterilized by boiling before the work commences, and dipped in an antiseptic fluid at frequent intervals during the operations. For this purpose machine-oil to which carbolic acid has been added in the proportion of one to ten is effective. All wounds inflicted should be immediately dressed with Stockholm tar, which, while not one of the strongest antiseptics, has the advantage of sticking to and forming a cover over the wound.

The floor of the shed should also receive attention. This may probably have been used for seasons without being thoroughly cleaned. Before operations commence the floor should be thoroughly scrubbed with an antiseptic fluid. All posts and division rails inside the shed should be similarly treated.

Through years of frequent use the yards are liable to become infected with the germ of the disease. It is essential, therefore, that this area should also receive careful attention. The surface soil should be well turned over, after which it should be liberally sprinkled with an antiseptic solution, following which a dressing of quicklime should be applied. All gates, posts, rails, &c., should receive a coating of tar, or lime-wash containing carbolic acid. The holding-paddocks adjacent to shearing-sheds are also frequently much soiled, and should be periodically, as opportunity occurs, ploughed up and allowed to lie to the sun before resowing.

When docking and castrating lambs care should be taken to see that the operation is not carried out for any two seasons in succession on the same area. The shearing-yards should be avoided as a site for this operation. Knives, instruments, and the hands of the operator should be sterilized before operating, and all antiseptic precaution taken during operations.

Although, naturally, the infection of lymph-adenitis may be present on any part of a farm, we feel sure that the shearing-shed and its vicinity, through frequent crowding of sheep, is the place where the risk is greatest, and that if the precautions here outlined were put in practice the incidence of the disease would be very considerably reduced.

—*Live-stock Division.*

THE ORCHARD.

CULTIVATION.

CULTIVATION will be continued during the coming month as opportunity offers, both for the suppression of seedling weeds and moisture-conservation. So many phases of fruitgrowing demand attention during the first two or three months of the growing-season that it is often very difficult to keep up with the routine, but any slackening in cultivation in the early part of the season usually results in a heavy growth and seeding of weeds

later on, when the weight of fruit precludes the use of implements. Deficiency of moisture is not likely to be apparent until well on in the ripening-season, when the rainfall is not sufficient to replace natural losses, consequently with late-ripening varieties such as Sturmer and Dougherty development is checked, colouring retarded, and the crop will pack out a large proportion of undersized, premature, reject fruit. The necessity for disking or harrowing land that is clean and in good condition may not be apparent, but not knowing how dry the season will be it is an operation that few can afford to neglect if the maximum is to be obtained for the year's working. Frequently stirring the surface is the only sure way of reducing loss through evaporation and retaining moisture in the levels occupied by the roots.

THINNING.

Thinning should be commenced as soon after the natural drop has finished as a good idea of the size of the crop can be obtained. Much of the benefit of thinning is lost if development proceeds to any extent before the surplus fruit is removed; but as varieties (more especially apricots) vary so much in different localities, previous behaviour must be relied upon to indicate when it is safe to thin without the danger of experiencing a late drop. Small fruit is an abomination inasmuch as the market for this class is limited, the cost in handling is greater than with large sizes, and too much of the crop goes into the reject bin. By limiting the crop a better average size is produced, the weight is more evenly distributed over the tree, disease-control is less difficult, handling-costs are reduced by eliminating the undersized fruit, and by enabling the tree to produce more wood the tendency to alternate-year cropping is lessened.

More growers err towards underthinning than overthinning, and the happy mean can only be obtained by considering the factors governing size. The habit of the variety, size and distribution of the crop, physical condition of the tree, and possible effect of adverse weather conditions must be studied and acted upon. Medium- to small-sized varieties will naturally receive heavier thinning than the larger kinds, but by reducing the crop too drastically with varieties like Jonathan and Cleopatra soft-fleshed fruit of poor keeping-quality may be expected. Apple and pears fruiting in clusters are usually left with from three to one to a spur, or sometimes alternate spurs are stripped. Short-stemmed varieties need careful spacing to prevent loss at picking-time, otherwise when one fruit is picked the remainder of the cluster will fall and become a loss.

Commence by removing any misshapen, blemished, or diseased fruits, and reduce to the required number of as near uniform size as possible. The centre apple in a cluster is usually short-stemmed and liable to be pushed off by the remaining fruit, and should be removed. In Delicious the centre fruit, or any others that develop at a much greater rate than the remainder, should be regarded with suspicion and discarded, for to these much of the mouldy-core trouble is traceable. Care should be taken to ensure that a portion of the stem remains on the spur. If the stems are torn off with the fruit the cluster is weakened and often falls.

Peaches, nectarines, and apricots should be spaced so that, when developed, no fruit touches its neighbour. Weak, willowy growths should be thinned to an ultimate height in conformity with their strength.

SPRAYING.

Spraying now will have become a routine operation, and the increased leafage will require a greater amount of material and more careful application if the full benefit is to be derived. No portion must be missed, and the frequency with which clusters of moth-infected fruit are seen on the ends

of long branches is sufficient to convict the man behind the spray-gun of having taken a long shot and missed—leaving a small portion without a protective covering, to become infected and stand out in contrast to the remainder of the tree.

Red mite and leaf-hopper may now be expected in increasing numbers, and the weakening of the lime-sulphur will decrease control. The devitalizing effect of red mite will seriously depreciate the value of the crop, the foliage assuming a blackened appearance and failing to function efficiently. Oil sprays, 1–100, plus Black Leaf, 1–800, plus spreader or special summer oils according to manufacturer's directions, will give satisfactory control. If necessary repeat in about a fortnight. Powdery mildew will require precipitated sulphur, 10–100, or dry-mix, and should not be neglected. In mixing combination sprays the correct sequence of adding the ingredients should be adhered to, or the efficiency of the spray will be lessened or destroyed. Spray burning is often attributable to failing to keep the ingredients in suspension by agitation, or to adding fresh material to spray that has been left standing.

Codlin-moth and leaf-roller control will be continued, and pears will require another black-spot spray of either bordeaux or lime-sulphur, according to variety. Stone-fruits will receive sulphur sprays according to weather conditions, but at intervals of not more than three weeks. On first appearance of pear slug, spray with arsenate of lead.

TYING AND PROPPING.

Props should be assembled in readiness for use, but in order to maintain cultivation as long as possible they should not be used until it is necessary. Now is a good time to overhaul any wiring or tying systems. It may be necessary to either raise existing wires or add others at a higher level, in order to prevent the weight above the stay from breaking the limbs. The use of screw-eyes inserted on the inside of the limbs at the required heights will be found quite satisfactory, and makes a use for wires broken in packing.

GRAFTS.

Grafts should be examined occasionally, and any ties above which the bark is beginning to bulge should be cut out by running a knife down the side of the limb opposite to the graft, leaving the tie adhering loosely. Sucker shoots breaking on the stump should not be removed too drastically, but allowed to develop to assist in maintaining the balance between root and top, in positions where they are not likely to take the lead from the graft. If the grafts are lagging they may be stimulated by pinching out the tips of adventitious shoots. In exposed situations it will be advisable to protect the grafts by staking, either securing the stake to the limb or driving three stakes into the ground equidistant round the trunk and bracing with strong twine. Grafts should not be omitted from the powdery-mildew sprays.

PICKING.

Stone-fruit picking will soon commence, and the grower's desire to get the first of the market often causes loss to the retailer and disappointment to the purchaser when immature fruit is marketed. Development should have proceeded only to the hard-ripe stage in peaches, nectarines, plums, and apricots, in order to give the retailer a reasonable prospect of disposal before they become overripe. The lightening of the ground-coloured portion provides the best indication of the right time to pick, and the proximity to market and length of time before the fruit is to be offered for sale must be taken into consideration.

Citrus-culture.

Growth on citrus-trees should now be well started, and if undesirable shoots can be rubbed out before they harden much time will be saved later on. Bordeaux, 4–4–40, should be continued for the control of verrucosis and fungoid diseases, if required, as young growth increases. Oil-spraying at 1–60 may be carried out when the main blossoming has finished and the young growth has started. Oiling before growth commences will produce serious defoliation. Red scale is the principal pest to receive attention, and any neglect will be reflected in the defoliated condition of the tree, as well as rendering the scale-infected fruit unfit for sale. Red scale to a lemon-tree is what San Jose scale is to a deciduous tree; though the individuals are small they multiply very rapidly, and their numbers are a severe strain on the tree's resources. This small, round, reddish-yellow scale may be found on every portion of the tree above ground, including the fruit, and its distribution necessitates very careful and thorough spraying. It is generally advisable to make a second application about a fortnight later, so as to catch adults or later hatchings which may have missed the first spray. For the control of thrips which blemish the surface of oranges, causing roughened pale-coloured patches, the addition of Black Leaf 40 will be beneficial. *Icerya purchasi*, the cottony cushion or fluted scale, will now be hatching, and, although held in check fairly well by the ladybird *Vedalia cardinalis*, any colonies should be immediately dealt with.

—*G. H. McIndoe, Orchard Instructor, Gisborne.*

POULTRY-KEEPING.

THE GROWING PULLETS.

THE time is now opportune to reiterate the advice that too much care cannot be taken in the feeding and handling of the growing pullet. The whole object of feeding during the period from incubation to the commencement of the laying-period should be to develop the bird's body and to build up her constitution. Many people force their pullets with rich food in order that they may commence to lay at an extremely early age. This is very undesirable; under such conditions the birds cannot grow into vigorous stock, while from a productive standpoint they will probably prove unprofitable, as in most cases their eggs will not be of sufficient size to warrant top prices; furthermore, they will never make desirable breeding-stock. It stands to reason that when fowls have been bred for generation after generation with the object of extreme egg-production the natural inclination to lay is so strongly developed that no forcing methods are needed to make them lay as soon as they have reached the correct productive age.

There is ample evidence that early maturity is not necessarily an indication of egg-laying capacity, and that premature laying is not a sign of the desirable breeding-bird. The principle that constitutional vigour is the basis in the breeding of all classes of live-stock cannot be too strongly emphasized, but with the high-type layer, upon which there is such an exceptional strain, constitution is of special significance, and constitution will never be maintained in a flock from which are bred birds which have been brought to profit before being fully developed. It will be realized that I am not speaking of the early laying of the well-developed bird, but of the pullet which commences to lay when only little more than half-grown.

The mistake should not be made of allowing the cockerels to run too long with the pullets. Obviously, if the former are to be well fed in order to put them into a good marketable condition at the age, say,

of four and a half months, the pullets will be unduly forced. The future table cockerel should be rapidly developed, and to this end should have a restricted range and a rich diet, whereas the pullet should have good range and an ample but simple ration. In other words, the future table cockerel demands artificial conditions, and the pullet as natural a scheme of treatment as possible. This does not imply any stinting of food, but rather that everything should tend to strong development, for on the treatment of a pullet during the period of her development very largely depends her future success as a layer. About six months old is a good time for a bird of a laying strain to commence her laying season, and this may be extended a month in the case of the heavy breeds.

OVERSUPPLY OF MEAT-SUBSTITUTES.

The desire to secure a big egg-yield has led several correspondents to overforce their birds with meat-substitutes, and ovarian troubles such as protrusion of the oviduct are a natural consequence. It is true that a liberal supply of nitrogenous material is essential to heavy egg-production, especially during the colder months of the year, but there is a danger that this may be carried out to excess during the spring and summer months. Obviously a bird does not require the same forcing-food at the present natural season as she does in winter, when egg-laying may be regarded as more or less artificial. The proportion of such materials as blood-meal and meat-meal should be reduced now, especially where birds have a free range, and thus have an opportunity, especially after rain, of picking up insects, worms, &c.

Not only does an overforcing ration tend towards ovarian disorders, but it also induces the production of thin-shelled eggs and eggs containing blood-spots. The chief danger in feeding a heavy meat ration is where this material is mixed with the mash and the latter is fed to all members of the flock quite irrespective of their age and laying-power. The oversupply of meat food is specially accentuated where the supply of grain material is not as liberal as it should be, which often happens owing to the poultry-keeper's incorrect reasoning that an extra supply of concentrated meat food will make up for the inadequate supply of grain.

It will usually be found a wise course, especially where a large flock is concerned, to feed highly nitrogenous material such as blood or meat meal sparingly in the morning mash, but it should also be always available for the birds to pick at in a separate receptacle. In this way ovarian disorders will be reduced to a minimum, as the bird is given an opportunity of balancing its own ration according to nature's dictates, and she can usually be relied upon to do this better than we can do it for her.

Speaking of meat-substitutes, a case came under my notice recently in which heavy mortality was taking place in a flock. On investigating the trouble it was ascertained that the owner of the plant had purchased and included in the mash a meat-and-bone mixture that had been specially prepared as a fertilizer. It was easy, under the circumstances, to point to the cause of the trouble. This is by no means the first case of the kind which has come under my notice, and it should be a warning to poultry-keepers that only those meat mixtures which are specially prepared for feeding to fowls should be used for that purpose.

Referring again to ovarian disorders such as protrusion of the oviduct, it may be mentioned that a trouble which is often confused with these is caused by a hen picking at the oviduct of another bird just when the latter is in the act of expelling an egg. This brings on a severe hæmorrhage, with the result that the other birds in the flock will pick at the bleeding

part, and often pull out the bowels and oviduct of the victim, causing it a cruel death. Where birds have acquired this vice, the only safe course is to darken the nests, or arrange them in such a way that the oviduct of the bird cannot be seen or picked at when in the act of laying. When a bird is on the point of expelling an egg, the oviduct protrudes more or less, and presents a highly flesh-coloured appearance. This induces the culprit, in its desire for animal food, to pick at and puncture the delicate organ. Careful observation will often locate the culprit, which frequently will be seen walking along in front of the nest-boxes, waiting for an opportunity to satisfy its cannibalistic inclination. Obviously, if such a bird is detected it should be immediately got rid of.

THE BREEDING COCKEREL.

The cockerel that has been selected for future breeding purposes should be treated in a similar manner to the growing pullet, and be given every opportunity to make slow but sound development. This implies plenty of plain nourishing food and ample range for exercise. As in the case of the pullet, premature maturity should be carefully guarded against. It is seldom or never that a very early-maturing male will grow to a desired size for the production of highly desirable stock. The same may be said in regard to the coddled bird, which cannot be regarded as being developed on sound principles, and the earliest and most common proof of this is often manifested in a weakness of the legs. Coddling, overcrowding, badly ventilated quarters, insufficient exercise, and high feeding are the principal causes of leg-weakness and kindred troubles which affect birds during their developing-period. Leg-weakness is one of the several indications that the vital essential in breeding poultry—maintenance of constitution—is not considered as it should be. It is easy to understand that the feeding of rich food to birds confined in small runs encourages size of body rather than sound development of the frame required to carry it.

For the production of good-sized bodies, and bone of the right quality and thickness, there is no food equal to good plump oats. Given whole it is difficult at times to get the birds to eat them. Trouble in this respect may be minimized by purchasing oats that are clipped or, better still, shelled. Do not neglect to give the birds an adequate supply of freshly crushed oyster-shell. This is of equal importance to the growing birds as to the laying hen, in providing lime for bodily requirements, and particularly bone-making.

Green food is absolutely necessary in the chicken stage., It is only during a short season, and then not at the present period, when it is required, that grass in the runs makes satisfactory green food. It is only the young tender shoots of the grass that are of value. Other green material must be supplied, such as chaffed lucerne, clover, silver-beet, cabbage, lettuce, and, best of all, watercress—that is, when tender leaves of the plant are available.

—F. C. Brown, Chief Poultry Instructor, Wellington.

THE APIARY.

FORMING NUCLEI.

With the approach of the main honey-flow and the prospect of more settled weather the beekeeper can turn his attention to the matter of forming nuclei, either with an eye to artificial increase or for queen-raising purposes. Whatever the object for which they are produced, the simplest method of forming nuclei is as follows :—

From the strongest colonies in the apiary take combs of sealed brood with adhering bees. Place two of these combs in each nucleus

hive, together with one comb of honey and an empty comb. It is as well, if the size of the hive will permit, to add a feeder. Close the entrance of the nucleus hive by tacking over it a piece of perforated zinc or wire cloth, and place the newly formed colony in a cool place for twenty-four hours. At the end of this time the hive may be placed on its permanent stand and the entrance opened. Some of the field-bees will return to the parent hives, but in the meantime much of the sealed brood will have hatched, and thus the absconders will hardly be missed. The small colony can at any time be given a ripe queen-cell, and under favourable weather conditions will soon possess a laying queen.

Nuclei can be built from one or two strong colonies, each of which should produce four or five small colonies; or several hives in the apiary may each be robbed of a frame of brood, thus providing increase while leaving the full colonies practically undiminished. When the young queen commences laying in a nucleus hive she should be left in possession until she has filled two frames with eggs, when she may be removed and given to a colony which requires requeening. The nucleus should at the same time be supplied with a ripe queen-cell, and the process repeated as long as young queens are required.

REQUEENING.

The most important bee within the hive is the queen, and it is useless to expect a colony to be productive unless she is a good one. It is therefore quite essential that all colonies should be headed with prolific queens of a good strain if vigorous workers are to be raised. Queen-rearing is an important adjunct in apiary-management, and unless provision is made to requeen systematically the beekeeper will find dwindling colonies and diminished crops. Where practicable, it is advisable to requeen the colonies every year. Exception, however, must be made in the case of hives containing breeding queens, and others retained on account of desirable drones. Where the operations of the beekeeper are such as to prevent annual requeening, provision should be made to replace half the queens in the apiary each year. If this plan is followed no colony will have queens more than two years old. With the aid of a few nuclei young queens can easily be hatched and mated, but in many cases—especially where a swarm has emerged from a hive—virgin queens can be secured, and form an easy solution of the requeening problem.

No better plan can be followed by the beginner than to utilize queen-cells produced naturally—that is, under the swarming impulse. In New Zealand it has been proved that the best months for raising queens are from November to January. During this period everything is favourable for the operation, as the hives are at their highest state of prosperity. Under normal conditions the workers and drones are also at their best, this being the swarming-period. There is practically no risk of robbing; the young queens are readily accepted, and will tend to reduce swarming. Moreover, a queen introduced during the months of prosperity will produce numbers of young bees for the winter, and still be fairly young in the following spring. In the case of after-swarms, these may be sifted through an excluder placed between two empty supers, when the queen or queens can be removed. The bees will then return to the parent hive.

These young queens can be utilized for starting nuclei. It always seems a pity to destroy the young vigorous queens bred under the swarming influence, and wherever there is an opportunity they should be saved and failing queens destroyed. A handy method of introducing virgin queens is by the smoke method. The old queen must first be removed from the hive that is to be requeened. The entrance is then contracted, and a few vigorous puffs of smoke are forced in at it. Then, before the bees have recovered from this treatment, the virgin queen is released at the entrance

piloted into the now queenless hive, and hastened therein by several more puffs of thick smoke. The hive is then closed altogether for about ten minutes, after which the entrance is once more opened slightly, and left like this till the next day, when the full entrance can once more be allowed.

DISEASE.

If the weather conditions have not been favourable for the treatment of foul-brood this should be undertaken when the first opportunity occurs. Do not delay until the main flow arrives. Remember that if colonies are treated early enough a surplus of honey will be secured and the expense of treatment recovered. Handling clean bees is a constant source of delight, but diseased bees are a never-ending cause of trouble. Particulars of the treatment of foul-brood have been given in these notes, and if fuller information is required this will be found in Bulletin No. 119, "American Foul-brood and its Treatment," which can be obtained free from the Apiary Instructor in each centre.

—E. A. Earp, Senior Apiary Instructor, Wellington.

HORTICULTURE.

THE TOMATO CROPS.

In unheated glasshouses the more valuable bunches of tomatoes at the base of the plant should now be ready for the market. Each season a number of inquiries are received about patchy ripening. This is a problem of nutrition, and may be generally corrected satisfactorily by a dose or two of sulphate of potash at 1 oz. to the square yard. Plants at this stage will require generous feeding to fill out the fruit, and a considerable amount of water in most cases. An average crop may be fed fortnightly now with a solution of superphosphate, sulphate of potash, and nitrate of soda, 1 oz. of the first and ½ oz. each of the others to the square yard. As a rule ventilation should be given at night and increased early on fine mornings. In the close humid weather occurring in some districts the crop should receive all the ventilation possible at this period.

The outside tomato crop, although somewhat delayed in many instances by occasional cold snaps early in the season, will now be well up the trellises, and require constant attention in the way of tying and suckering. Cultivation will also be necessary to keep down weeds and promote growth, but it must be shallow. Quite a number of crops are depreciated each season to the extent of 50 per cent. through deep cultivation, which, instead of promoting growth, seriously dwarfs the plants by interfering with the roots.

SMALL-FRUITS.

The berry harvest will now be at its peak; strawberries, raspberries, and currants will require regular and careful picking to prevent waste. Strawberry-beds that are fruiting must be kept clear of runners, and raspberry crops on land inclined to be light will receive great benefit if they can be irrigated, especially if the weather should happen to be dry.

THE MARKET-GARDEN.

Potato crops in districts subject to late blight should now be sprayed with bordeaux, 4–4–40, repeating the application after an interval of two or three weeks with a slightly stronger mixture. A third application should be made if the conditions are bad.

Good vigorous crops of onions should not be much troubled with mildew, but where this disease prevails some improvement may be obtained by applying sulphide of potassium at .1 oz. to 3–4 gallons of water.

The seedling beds of winter cabbage and broccoli are often attacked with aphis and caterpillars at this season. The remedy is to grow them thinly and vigorously. A spray composed of arsenate-of-lead and tobacco concentrate will free them from these pests; one or two applications at an interval of a week or ten days should be given before they are removed from the seed-beds.

Celery seedlings are now very subject to fungus leaf-blights, which check the growth and spoil the appearance of the crop. Large clean sticks may only be grown by careful attention to spraying. One or two applications of bordeaux at intervals of a fortnight should be given before the plants are removed from the beds, and continued after they are set out in the field.

In the cooler districts savoys, cauliflower, broccoli, and leeks may now be planted out. Water the beds well the day before the operation. Lift the plants with care and handle them well, using trays for transportation to the field, and protecting them from exposure to sun and wind as far as possible. If drills are drawn with a marker to indicate the rows the planting may be done expeditiously. If the weather is dry they should be watered in. If desired, they may be planted between dwarf peas before that crop is removed. Or an old strawberry-bed will provide excellent conditions for a crop of this kind. Burn off the litter and lightly cultivate the land before planting.

For leeks draw 6-in. drills and set the plants deeply in the bottom. For large tender sticks a rich soil is required. This hardy crop deserves more attention in the colder localities.

Tobacco-culture.

The first batch of tobacco-plants set out in the field will now be reaching maturity, and great care will be needed to prevent damaging the leaf when cultivating. In fact, if the crop is inclined to be coarse it will be as well to discontinue this operation with a view to refining the plants and ripening them off. Towards the end of December they will commence to blossom, and when the majority reach this stage of growth it will be necessary to top them to prevent depreciation of the leaves, which would take place through the blossom taking the sap of the plant to the detriment of the foliage. This is one instance of the economy of an even crop, as the plants then flower at the same time, and topping may be done in one operation instead of a number, as is necessary when the development is irregular.

Just how much to remove when topping requires careful judgment and experience. Supposing it is intended to air-cure the crop, break away the two or three small torn leaves at the base of the plant (the lugs), count ten to twelve leaves up the stalk, and remove the top just above the uppermost. This treatment will meet the average case, but if the weather is moist and the plants vigorous one or two more leaves may be left to absorb the vigorous growth. This will avoid coarseness in the leaf, and reduce the tendency to form unduly strong side shoots ("suckers") in the axils of the leaves. In any case, these will develop to some extent, and must be broken out before they exceed 3 in. in length. It is important to remove all lugs, tops, and suckers to the open space in the middle of the rows so that they may dry out and break up. Careless operators sometimes allow some of them to lie on the growing leaves of the plant, where they do serious damage by causing decay.

If the crop is to be cured in a kiln no priming is done—that is, the lugs are not removed—and the top is taken off at a point where the leaves are of the size of the cherry-laurel. Careful attention to suckering the plants subsequently will be necessary in either case.

—W. C. Hyde, Horticulturist, Wellington.

TESTING OF PUREBRED DAIRY COWS.

C.O.R. LIST FOR OCTOBER, 1929.

* Cow milked three times daily during whole lactation period. † Milked three times daily during part of period

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS.					
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Pukepapa Shirley May	H. Cole, Waitara.. ..	2 48	245·3	305	9,108·6	605·90
Idalia's King's Princess	T. Wells, Dargaville ..	2 50	240·1	305	8,113·4	565·15
Beechland's Lady Twylish	W. R. Booth, Te Rapa ..	1 354	240·5	354	8,836·1	477·36
Raeburn Poppy Day	J. S. Rae, Taneatua ..	1 233	240·5	340	7,091·0	464·21
Raleigh's Ruby ..	O. McAloon, Te Wera ..	1 230	240·5	305	7,866·2	459·68
Clendon Beauty ..	H. Peoples, Drury ..	1 348	240·5	305	8,438·5	455·34
Pukatea Patricia ..	G. R. Bell, Waipuku ..	1 343	240·5	306	7,465·9	454·37
Coniston Jessamine ..	R. Waterhouse, Papakura ..	2 57	246·2	305	7,381·0	452·80
Solo Bell	J. Hampton, Timaru ..	2 82	248·7	312	7,060·8	451·39
Gowanlea White Wings	J. Robb, Wanganui ..	1 302	240·5	305	7,461·9	450·92
Someview Thelma ..	A. E. Phillips, Maunu ..	1 350	240·5	305	7,318·1	447·03
Bethune La Andelusia	A. S. W. Hazard, Waimate N.	2 12	241·7	305	8,963·9	442·59
Linden Grove Dolcebell	G. R. and H. Hutchinson, Auckland	2 34	243·9	305	7,752·0	433·79
Jerseydale Tilly ..	J. Pettigrew, Pihama ..	2 4	240·9	303	6,476·8	433·38
Royton Elva ..	A. Moreland and Sons, Te Rapa	2 35	244·0	308	7,331·2	424·41
Raeburn Golden Sunbeam	J. S. Rae, Taneatua ..	2 31	243·6	324	8,720·2	419·10
Raeburn Rainbow ..	J. S. Rae, Taneatua ..	2 21	242·6	335	6,331·8	413·70
Someview Tessie ..	A. E. Phillips, Maunu ..	2 28	243·1	305	8,077·8	411·23
Croydon Charm ..	W. Crosby, Waipuku ..	2 50	245·5	308	6,549·0	410·48
Waif's Fox.. ..	A. E. Sly, Whakaronga ..	1 307	240·5	332	6,079·0	390·85
Ivry's Quicksilver ..	H. W. Le Bailly, Buckland	2 4	240·9	305	7,621·8	386·80
Raeburn Afterglow ..	J. S. Rae, Taneatua ..	1 140	240·5	340	6,523·0	382·32
Brentwood Emerald..	C. A. Willis, Pukekohe ..	2 27	243·2	354	7,047·9	382·26
Bride's Waif ..	A. E. Sly, Whakaronga ..	1 304	240·5	314	6,748·6	372·62
Croydon Choice ..	W. Crosby, Waipuku ..	2 38	244·3	296	6,070·6	369·70
Mt. Kowhai Grateful	R. J. Johnston, Runciman	1 286	240·5	305	6,620·0	365·14
Brentwood Freda ..	C. A. Willis, Pukekohe ..	2 53	245·8	342	6,012·1	361·73
Linden Grove Silverlocks	G. R. and H. Hutchinson, Auckland	1 358	240·5	355	6,859·9	362·08
Waitakohe Cleopatra	J. T. Warman, Katikati ..	1 326	240·5	365	6,297·6	361·26
Brentwood Lady Winnie	C. A. Willis, Pukekohe ..	2 8	241·3	340	6,897·8	355·40
Green View Sea Pearl	R. Wattam, Cambridge ..	2 56	246·1	365	7,307·6	353·43
Derry's Lady ..	S. J. Robinson, Matamata..	1 257	240·5	365	6,256·8	353·21
Hillside Sheilah ..	S. J. Robinson, Matamata..	1 315	240·5	360	5,926·1	349·13
Barnaigh Rozel ..	W. T. S. Wilson, Otahuhu..	2 31	243·6	342	5,757·4	348·35
Joyful Beauty ..	A. E. Sly, Whakaronga ..	2 29	243·4	282	7,287·7	346·08
Llangollen Trixie ..	J. T. Entwisle, Cambridge..	1 285	240·5	365	5,884·2	333·77
Iron Victress ..	H. W. Le Bailly, Buckland	1 347	240·5	365	5,768·3	318·03
Llangollen Aster ..	J. T. Entwistle, Cambridge	2 3	240·8	353	5,350·6	310·26
Bethune Kathleen ..	A. S. W. Hazard, Waimate N.	1 357	240·5	265	6,950·2	283·05
Passion's Princess ..	H. Naylor, Te Rapa ..	1 341	240·5	331	5,101·3	277·29
Homeside Myrtle ..	H. Rogers, Pukekohe ..	2 0	240·5	325	5,758·7	274·12
Waiora Pretty Bell ..	A. E. Peppercorn, Cambridge	2 30	243·5	345	5,817·3	271·77
Derry's Cute Girl ..	S. J. Robinson, Matamata..	2 31	243·6	331	4,902·7	271·54
Derry's Princess ..	S. J. Robinson, Matamata..	1 327	240·5	365	5,365·5	270·61
Golden Favours ..	H. Naylor, Te Rapa ..	2 12	241·7	282	4,203·3	256·38

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS—*continued*					
Senior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Phantom's Primrose	G. S. B. Morrison, Maungatapere	2 249	265·4	365	9,252·1	534·87
Selside Mermaid's Flower	J. Gibson, Stratford	2 335	274·0	344	7·876·9	486·04
Silo Dale Gay Girl	A. G. Somervell, Takapau	2 263	266·8	337	7,601·6	477·85
Waihoehoe Dahlia	E. Fielding, Drury	2 226	263·1	365	7,463·9	444·67
Raeburn Rosebud	J. S. Rae, Taneatua	2 352	275·7	364	7,234·8	426·83
Coniston Eminence	R. Waterhouse, Papakura	2 137	254·2	365	6,552·1	396·38
Three-year-old.						
Waihoehoe Lily	E. Fielding, Drury	3 179	294·9	365	9,767·7	579·26
Orange Dale Rower's Queen	W. J. Hall and Son (Estate of), Matatoki	3 251	302·1	365	10,621·0	564·10
Fairy Meadows Goldie	A. Hazelton, Waihou	3 318	308·8	361	7,477·8	512·14
Almadale Silver Bowl	H. Rogers, Pukekohe	3 8	277·8	365	8,019·3	493·26
Northland Merriment	E. W. Jacobs, Horotiu	3 143	291·3	365	10·184·6	486·58
Kahuwera Madge	J. V. Mortensen, Pio Pio	3 6	277·6	365	8,363·4	481·66
Oxford Dale Plume	J. T. Entwisle, Cambridge	3 361	313·1	352	7,101·9	474·50
Raeburn Pearl	J. S. Rae, Taneatua	3 199	296·9	335	9,618·9	472·00
Flat Park Golden Mary	W. J. Hall and Son (Estate of), Matatoki	3 11	278·1	280	8,279·1	437·72
Brooklyn Lady Meg	H. J. Lancaster, Glen Oroua	3 342	311·2	233	7,297·9	420·34
Hostage of Bulls	Dr. F. J. Watson, Bulls	3 155	292·5	328	7,359·4	358·61
Four-year-old.						
Kahuwera Bo-Peep	Messrs. Johnson Brothers, Mangapiko	4 38	317·3	365	10,749·1	680·67
Waihoehoe Rose	E. Fielding, Drury	4 265	340·0	364	10,576·5	587·04
Kakuwera Anetta	J. V. Mortensen, Pio Pio	4 337	347·2	365	10,236·4	550·52
Beechlands Bright Lady	A. Moreland and Sons, Te Rapa	4 337	347·2	365	7,214·6	502·89
Silence of Rosy Creek	O. McAloon, Te Wera	4 30	316·5	316	8,791·2	488·07
Waihoehoe Violet	E. Fielding, Drury	4 350	348·5	365	7,115·0	439·28
Breezy's Duchess	J. Gibson, Stratford	4 342	347·7	307	6,842·0	408·23
Bacchante of Aria	M. V. Reeve-Smith, Aria	4 291	342·6	304	7,893·9	402·63
Joy's Belle	A. G. Brosnahan, Whangara	4 343	347·8	343	8,935·9	398·52
Fairy Meadows Twylish	E. J. Mears, Hamilton	4 5	314·0	297	7,413·3	337·95
Mature.						
Connemara's Lady	O. McAloon, Te Wera	5 7	350·0	353	12,275·9	682·33
Gowanbrae Gem	C. G. Stuart, Rockville	5 356	350·0	365	12,918·8	632·02
St. Aubin's Gladiolus	J. G. Harvey, Taupiri	6 363	350·0	364	11,431·8	627·71
Barnaigh Twylish Lass	W. T. S. Wilson, Otahuhu	5 356	350·0	365	9,411·4	607·63
Majestic's Princess	W. Hazelwood, Northcote	6 343	350·0	360	10,342·8	572·13
Tulip's Minta May	H. Cole, Waitara	5 319	350·0	304	9,972·6	554·25
White Satin	E. Fielding, Drury	13 13	350·0	365	10,465·6	556·83
Lady Caius of Inaha	O. Sutton and Sons, Richmond	6 11	350·0	365	11,908·8	549·50
Springlea Sweet	Mrs. I. W. Speirs, Levin	5 323	350·0	353	10,231·5	545·45
Waihoehoe Aster	E. Fielding, Drury	5 180	350·0	323	8,842·9	519·30
Marshlands Butterfly	Truby King, Stratford	5 26	350·0	305	7,560·2	478·25
Heathcote Morning Glory	Mrs. E. E. Norton, Waimauku	6 303	350·0	355	8,310·1	455·00
Waihoehoe Natalie	E. Fielding, Drury	5 242	350·0	307	9,404·8	452·54
Kapuna Lady	J. Davies, Maxwelltown	5 53	350·0	296	8,484·0	421·65
Pride's Fortune	J. T. Entwistle, Cambridge	6 355	350·0	312	7,849·0	414·43
Hope's Mermaid	A. E. Sly, Whakaronga	6 363	350·0	338	8,015·9	404·54

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		FRIESIANS.				
		Yrs. dys.	lb.		lb.	lb.
Junior Two-year-old.						
Pareora Echo Pearl*	C. J. Neville, Clandeboye ..	2 84	248·9	328	12,647·5	526·59
Totara Sylvia Beatus*	Piri Land Co., Auckland ..	2 153	255·8	365	14,186·8	504·43
Pareora Echo Posch*	A. S. Elworthy, Timaru ..	2 91	249·6	365	14,252·2	464·31
Totara Matador Echo*	Piri Land Co., Auckland ..	1 329	240·5	365	12,261·1	428·18
Senior Two-year-old.						
Totara Sylvia Lass*	Piri Land Co., Auckland ..	2 276	268·1	365	19,006·1	690·02
Totara Sylvia Trixy*	Piri Land Co., Auckland ..	2 198	260·3	365	17·942·6	606·24
Rosevale Sylvia Nancy*	G. G. McRae, Waimate ..	2 315	272·0	365	12,632·6	445·28
Totara Tehee Paxton*	Piri Land Co., Auckland ..	2 262	266·7	365	13,682·0	433·02
Junior Three-year-old.						
Totara Sylvia Colantha*	Piri Land Co., Auckland ..	3 149	291·9	365	17,510·1	594·64
Junior Four-year-old.						
Grebegga of Royal Vale	H. H. Hicks, Turua ..	4 30	316·5	351	11,695·3	403·11
Mature.						
Glen Iris Ruby* ..	Wesley Training College, Paerata	6 275	350·0	365	18,222·9	638·14
Bloomfield Fayne De Kol*	Piri Land Co., Auckland ..	6 277	350·0	365	18,015·5	574·63
Hengerveld Rongotea Sunbeam	P. Hodder, Carterton ..	5 96	350·0	348	14,697·2	506·31
		MILKING SHORTHORNS.				
Senior Three-year-old.						
Pukerimu Cherry 5th	Fisher Bros., Pukerimu ..	3 296	306·6	339	8,872·9	343·29
Mature.						
Riverdale Florrie 2nd	T. W. Wardlaw, Waimana ..	..	350·0	365	17,359·6	761·17
Bushcroft Matangi Pet 2nd	H. Bond, Rangiotu ..	9 2	350·0	318	10,056·1	412·31
		AYRSHIRES.				
Mature.						
Elims Paeony ..	A. R. Claridge, Toko ..	..	350·0	337	12,430·7	508·18
Elims Flora ..	A. R. Claridge, Toko ..	7 309	350·0	365	11,023·1	412·15
	Second-class Certificates					
	Friesians.					
Mature.						
Ryvington Pontiac Duchess	T. P. Hodgson Estate, Tamahere	5 364	350·0	365	15,296·5	598·43

Liver-fluke in Sheep.—The annual report of the Live-stock Division for 1928–29 states that there has been a considerable improvement in the affected areas of the Hawke's Bay District as regards this trouble. Much good work in eradicating the water-snail host has been undertaken by the farmers, with satisfactory results. During the year investigations showed that liver-fluke is more prevalent in the Gisborne district than was supposed. Whenever fluke is found, instruction and advice, with a view to prevention, is given in all cases.

WEATHER RECORDS: OCTOBER, 1929.

Dominion Meteorological Office.

GENERAL NOTES.

THE month of October was notable for the exceptionally dry conditions experienced over nearly the whole of the Dominion. A few places from Auckland northwards had an excess, and in the East Cape, Gisborne, and Napier districts—more especially the coastal portions—the average was also exceeded; but elsewhere in the North Island and the whole of the South Island recorded below normal falls. Oamaru had only 5 points, which is the lowest month's total ever recorded there. In the east coast provinces of the South Island and Otago generally the deficiencies were considerable, and this, combined with the cold temperatures experienced, severely retarded the growth of vegetation.

Throughout the country districts in the South Island the backwardness of the season was clearly evident, and feed on well-stocked land was rather scarce in some cases. In the North Island there were more days on which rain fell, and the scarcity of feed was not so apparent, so that usually stock kept in good condition, although feed was rather short for cattle.

Temperatures were, on the whole, below average, and there were rather more frosts than is usual at this period, those on the 15th and 25th doing some damage to early-sown crops.

From the 1st to the 7th, and again from the 10th to the 17th, fine weather was experienced, practically generally under the influence of well-developed anticyclones. The remainder of the month, however, except for occasional brief intervals, was subject to changeable and unsettled conditions.

On the 8th the front of a vigorous depression moved on to southern New Zealand while a cyclone was passing to the northward. Strong east winds prevailed at this time north of Auckland, with some rain. Unsettled conditions gradually became general with the advance of the southern depression, and on the 9th rain fell in most districts, but in the South Island the falls were only light and scattered. Motu, in the Gisborne district, had as much as 421 points on the 9th. The passage eastwards of this depression brought a cool southerly change during the night of the 10th.

The most severe weather during the month was that experienced during the 23rd and 24th, and was associated with an intense cyclone. The latter had moved slowly from the New South Wales coast on to the central Tasman Sea, but from the 22nd it made more rapid progress, and by the night of the 22nd had moved on to northern New Zealand. General rain fell in connection with this disturbance, except in Westland, where fine weather continued to prevail. By 9 a.m. on the 23rd winds had changed to south-east or southerly south of New Plymouth and East Cape, with a considerable drop in temperature, and on the 24th southerlies were prevailing generally, with strong gales in and north of Cook Strait. Exceptionally heavy rain fell at this time in the Auckland, Gisborne, and Hawke's Bay districts. On the 22nd a violent hailstorm occurred at Waipawa.

Considerable damage was done by the south-east gale at New Plymouth on the 24th, iron roofs being twisted and trees uprooted, while two partially built houses were demolished.

Fairly general rain fell also on the 31st while a double-centred disturbance was crossing the Dominion. One of the centres was located west of the North Island, and during the night of the 31st it was responsible for stormy conditions in parts of Auckland Province. Its effects were particularly severe in the Riverhead, Kumeu, and New Lynn districts, and in some places thunderstorms were experienced accompanied by very heavy rain.

Although there were short periods when the winds were severe, on the whole there was a relative absence of strong winds during the month.

RAINFALL FOR OCTOBER, 1929, AT REPRESENTATIVE STATIONS.

No.	Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average October Rainfall.
	North Island.	Inches.		Inches.	Inches.
1	Kaitaia	3·04	14	1·01	4·48
2	Russell	4·00	11	1·03	4·64
3	Whangarei	5·86	13	2·14	4·96
4	Auckland	5·05	13	2·38	3·64
5	Hamilton	2·91	12	0·90	4·79
5A	Rotorua	4·49	10	1·46	5·25
6	Kawhia	2·01	6	1·04	5·48
7	New Plymouth	2·66	9	0·86	5·61
8	Riversdale, Inglewood ..	4·14	15	1·31	10·37
9	Whangamomona	4·04	8	1·03	9·01
10	Eltham	2·30	9	0·72	4·11
11	Tairua	4·10	10	0·94	6·46
12	Tauranga	4·63	11	0·77	5·25
13	Maraehako Station, Opotiki	7·94	12	2·08	5·45
14	Gisborne	4·19	11	2·23	2·80
15	Taupo	3·15	8	0·93	4·48
16	Napier	2·80	10	1·43	2·30
17	Maraekakaho Stn., Hastings	2·03	13	0·85	3·09
18	Taihape	0·71	9	0·23	3·99
19	Masterton	1·98	10	1·06	3·32
20	Patea	..	..	..	4·33
21	Wanganui	0·39	4	0·16	3·67
22	Foxton	0·83	6	0·38	2·92
23	Wellington (Karori Reservoir)	2·50	15	1·12	3·83
	South Island.				
24	Westport	3·60	11	1·19	6·97
25	Greymouth	6·38	11	2·10	10·03
26	Hokitika	7·57	11	2·08	11·84
27	Ross	8·87	10	1·86	15·16
28	Arthur's Pass	..	..	..	19·78
29	Okuru	12·61	9	4·44	15·37
30	Collingwood	..	..	..	11·03
31	Nelson	1·63	6	1·01	3·59
32	Spring Creek, Blenheim ..	1·29	7	0·42	2·72
33	Tophouse	2·07	8	0·90	5·90
34	Hanmer Springs	1·93	14	0·53	3·31
35	Highfield, Waiau ..	0·90	5	0·42	2·60
36	Gore Bay	0·32	3	0·12	2·25
37	Christchurch	0·05	4	0·02	1·68
38	Timaru	0·14	4	0·04	1·95
39	Lambrook Station, Fairlie ..	0·10	2	0·06	2·01
40	Benmore Station, Clearburn	0·12	3	0·08	2·13
41	Oamaru	0·05	3	0·03	1·68
42	Queenstown	0·97	2	0·94	3·48
43	Clyde	0·03	1	0·03	1·58
44	Dunedin	0·40	7	0·15	3·09
45	Wendon	0·53	4	0·21	2·66
46	Gore	0·46	9	0·15	3·26
47	Invercargill	0·66	11	0·16	4·44
48	Puysegur Point	4·16	19	0·90	8·16
49	Half-moon Bay	2·35	13	0·59	4·94

—*Edward Kidson, Director of Meteorological Services, Wellington, 6/11/29.*

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

ARTHRITIS IN LAMBS.

M. G., Mangorei Road, New Plymouth :—

Can you give me advice about a complaint attacking young lambs here? Some five or six young lambs in my neighbour's small flock, when only a few days old, have become unable to use their legs. The knee-joints are affected and swollen, the complaint travelling from one leg to another. Some of the sufferers have died, others are lying about being fed as pets, and only one has so far improved sufficiently to walk again.

The Live-stock Division :—

The trouble affecting the lambs is what is commonly known as arthritis. This is the term applied to inflammation of one or more joints, usually associated with a certain amount of pus-formation in the joint. The infection may gain entrance either through the unhealed umbilicus (navel) at time of or immediately after birth, or in the case of older lambs through the wounds resulting from tailing operations. The complaint is comparable to joint-ill or navel-ill in foals. Any lambs dead from arthritis — in fact, all carcasses of animals dying from any cause—should be burned or buried deeply in lime to prevent contamination of the surface soils and pastures. The bacteria responsible for this trouble have a special affinity for settling in joints of the new-born, the joints most commonly affected being the knee, hock, and stifle. Ewes about to lamb should be placed in a clean paddock, as free as possible from contamination of any previous animal affected with disease. At time of marking and tailing the knife used requires to be sterilized by boiling, and during the operations the use of reliable antiseptics is recommended. The use of temporary yards for these operations—selecting a fresh, clean site each year—is also to be commended.

PREPARING TOBACCO FOR SMOKING AND SPRAY.

O. T. K., Otaki :—

Kindly give me directions for curing small quantities of tobacco for smoking, also for making a nicotine spray.

The Horticulture Division :—

Small quantities of tobacco should be cured in a ventilated shed in the manner described in the Department's Bulletin No. 137. Then, as there will be an insufficient quantity to bulk in the usual way, the leaves when soft should be stripped from the stalks and tied into "hands." These should be packed in a case of suitable size, and a few boards placed on top with a moderate weight to compress the leaf as it subsides. Examine the package occasionally for a week or two to see that it does not overheat. If the temperature rises over 80° F. the material should be taken out, aired a little, and repacked. In six months or so the tobacco may be used, but it will improve if kept in this way for two years. Keep the parcel in a moderately warm room.

To make tobacco-wash for spraying, chop the waste up small, and, if possible, put it through a mill. Then take 2 lb. of the dust, 7 oz. of quicklime, and 3 gallons rain-water. Slake the lime and pour the milk into the water. Stir in the tobacco-dust and let it stand thirty-six hours, stirring it twice a day. Then strain it through some coarse sacking, and wash the residue until the volume of liquor measures 3 gallons. Add an equal quantity of water, making it up to 6 gallons, and apply.

"BLOWING" OF COWS ON SPRING PASTURE.

A. R. H., Feilding :—

Of late our nine cows, which have been running on 7 acres of rich land, have been troubled with blowing. This pasture was heavily top-dressed with basic slag last year and with superphosphate this year. Naturally there is an abnormal growth of white clover and rye-grass. One cow blew itself several times and has since died, and now a heifer is troubled. At that time the cows were only there in the daytime, so now we are keeping them there the whole time, but the same heifer was blown to-night. Do you think the top-dressing has anything to do with the matter? And could you send me a remedy at your earliest convenience, as we wish to prevent them from blowing as soon as possible?

The Live-stock Division :—

It is admitted that anything which tends to produce a surplus growth of white clover in early spring pasture increases the tendency to cows becoming "blown." The trouble arises most readily when the animals' stomachs are in a partially distended state before being put on the clover, consequently the obvious preventive is some hard, dry feed before ingestion of the clover. In order, therefore, that the beneficial results of the spring feed should not be lost to milk-production, judicious rotation of grazing is necessary. In practice the use of a night paddock, feeding out hay overnight, and placing the cows on clover only when the dew is well off in the morning, is probably the best method. (The risk is greatly increased if the growth is laden with moisture.) Cows on clover must be carefully watched when first put on. It is better only to allow a short period of grazing to begin with, increasing as the feed is being tolerated. Regarding the immediate treatment of "blown" cows, a drench composed of one wine-glassful of turpentine shaken up in a pint of raw linseed-oil is probably as good as any other remedy. In very acute cases, in which there is danger of suffocation, puncture of the paunch must be resorted to. This is performed on the left side, the puncture being made at a point equidistant from the last rib and the paunch-bone. If a trocar and cannula are not available, a long narrow-bladed knife can be used, which should be frequently turned in the wound to allow exit of gas.

BEEKEEPING INQUIRIES.

T., Richmond :—

Would you please give me information as follows: Is the Deadman super-cleaner system still in use at the Government apiary? Is it a safe system for a beginner, and what are its disadvantages? Of what use, if any, is the common gorse-flower to bees, and does it give marketable honey?

The Horticulture Division :—

The Deadman super-cleaner system is not now in use in the Government apiary. It is not regarded as a safe system for a beginner to use, the chief disadvantage being that in the cooler climates the bees will not readily leave the super when this method is employed. In New Zealand gorse is of value to the beekeeper in its pollen only. It does not secrete honey in marketable quantities.

Control of Red Mite on Apple-trees.—Mr. G. Stratford, Orchard Instructor, Motueka, reports that tests carried out with summer spraying-oil during last season were very successful in the control of red mite. He remarks: "Spraying was done the first week in February at strength 1–100, the result being a good kill with practically no spotting of the fruit. A later spray on Delicious cleaned the trees well, there being no necessity to clean the fruit when grading for export. From these results I am prepared to recommend two sprayings this season—one towards the end of January, and another towards the end of February."

SEEDS IMPORTATION REGULATIONS.

REGULATIONS under the Seeds Importation Act, 1927 (revoking the regulations of 28th April, 1928), were gazetted on 17th October, 1929, as follows:—

1. (1) These regulations may be cited as "The Seeds Importation Regulations, 1929." (2) These regulations shall come into force on the date of publication in the *Gazette*, but shall not apply to any seed that may then be in transit to the Dominion. (3) For the purposes of these regulations, unless the context otherwise requires, "import" includes attempting to import or being concerned in importing; "seed" means cocksfoot (*Dactylis glomerata*), lucerne (*Medicago sativa*), or white clover (*Trifolium repens*) seed, or any other seed declared by the Governor-General in Council to be subject to the provisions of the said Act; "Inspector" means any person appointed as Inspector for the purposes of the said Act.

2. (1) Not less than one per centum of each package of cocksfoot-seed and not less than ten per centum of each package of all other seed imported into New Zealand shall be stained prior to importation with a red colouring-matter. (2) The colouring-matter to be used shall be either an alcoholic solution of saffranin or a specially prepared and effective fluid seed-staining dye. (3) Staining shall be done in the case of cocksfoot-seed by mixing not less than one per centum of the bulk and in the case of all other seed by mixing not less than ten per centum of the bulk with the stain, and then blending the stained parcel with the bulk lot.

3. (1) The form of certificate required by subsection (2) of section 5 of the said Act shall be in the form set out in the First Schedule hereto. (2) The certificate shall be in duplicate. One copy shall be retained by the importer at the port of entry, and the other shall be supplied by him to the Inspector, who shall, on being satisfied that the seed covered by the certificate has been effectively stained in the manner prescribed in these regulations, issue a permit in the form set out in the Second Schedule hereto for the seed to be landed.

4. The following shall be the only ports of entry for seed: Auckland, Wellington, Lyttelton, Gisborne, Napier, New Plymouth, Dunedin, Port Chalmers, Bluff, Timaru, Wairau (including Picton), Oamaru, Wanganui.

5. Every person who imports or attempts to import, or is concerned in importing, any seed in contravention of these regulations commits an offence, and is liable to a fine not exceeding twenty pounds.

ARECOLINE HYDROBROMIDE FOR DOG TAPEWORMS.

IN connection with the campaign against hydatid disease, arecoline hydrobromide in tabloid form in suitable doses for dogs is now being put up by Kempthorne, Prosser, and Co. Those requiring this very reliable drug, the use of which was described in last month's *Journal*, should obtain supplies through their chemist or direct from Kempthorne, Prosser, and Co.

Fumigation of Imported Tree-seed.—"After a two-years trial" (says the annual report of the State Forest Service for 1928–29) "it has been found that, with the exception of formalin solution, the fumigation of tree-seed by chemicals has no appreciable harmful effect on subsequent germination, but in some cases appears to increase it. Formalin solution was found to be universally injurious to the germination of all five species which were treated. Carbon bisulphide increased the germination in four out of six species dealt with; this chemical is easy to apply and is also an effective insecticide. Gas fumigation with a mixture of potassium permanganate and formaldehyde, and also treatments with solutions of mercuric chloride and of sulphurus acid, showed no appreciable harmful effects either on the germination or on the subsequent growth of the seedlings. As a result of this study and of correlated studies carried out by the Forest Entomologist, all seed imported by the Service is at once subjected to fumigation with bisulphide of carbon as a matter of ordinary routine. Risk of importation of seed-feeding insects is thus entirely eliminated, without detriment to seed-viability."

IMPERIAL AGRICULTURAL RESEARCH BUREAUX.

FOLLOWING the decision of the Imperial Agriculture Research Conference of 1927, a number of research bureaux have recently been set up to act as clearing-houses of information for various branches of investigation conducted in different parts of the Empire. The personal acting link in each Dominion is the local correspondent, and as regards New Zealand the Government—per medium of the Department of Scientific and Industrial Research—has now appointed such correspondents. The various bureaux established, together with their respective headquarters, directors, and New Zealand correspondents, are as follows :—

Animal Nutrition.—Rowett Institute, Aberdeen : Dr. J. B. Orr, director ; Mr. B. C. Aston, Chief Chemist, Department of Agriculture, Wellington, local correspondent.

Soil Science.—Rothamsted Experimental Station, England : Sir John Russell, director ; Mr. T. Rigg, Cawthron Institute, Nelson, local correspondent.

Animal Genetics.—Animal Breeding Research Department, Edinburgh University : Professor F. E. Crew, director ; Professor W. Riddet and Dr. F. W. Dry, Massey Agricultural College, Palmerston North, local correspondents.

Agricultural Parasitology.—Institute of Agricultural Parasitology, St. Albans, England : Professor R. T. Leiper, director ; Mr. C. S. M. Hopkirk, Veterinary Laboratory, Department of Agriculture, Wallaceville, Wellington, and Dr. D. Miller, Cawthron Institute, Nelson, local correspondents.

Plant Genetics (Herbage Plants).—Welsh Plant Breeding Station, Aberystwith, Wales : Professor R. G. Stapleton, director ; Mr. E. Bruce Levy, Agrostologist, Plant Research Station, Palmerston North, local correspondent.

Fruit Production.—East Malling Research Station, Kent, England : Mr. R. G. Hatten, director ; Mr. J. A. Campbell, Director, Horticulture Division, Department of Agriculture, Wellington, local correspondent.

Plant Genetics (other than Herbage Plants).—Plant Breeding Institute, Cambridge University, England : Sir Rowland Biffen, director ; Dr. F. W. Hilgendorf, Canterbury Agricultural College, Lincoln, local correspondent.

Animal Health.—Veterinary Research Laboratory, Weybridge, England : Dr. W. H. Andrews, director ; Mr. C. S. M. Hopkirk, Veterinary Laboratory, Department of Agriculture, Wallaceville, local correspondent.

The establishment of a Bureau of Economic Botany is at present under consideration, and Dr. H. H. Allan, of the Plant Research Station, Palmerston North, has been nominated as local correspondent.

INVENTIONS OF AGRICULTURAL INTEREST.

APPLICATIONS for patents, published with abridged specifications in the *New Zealand Patent Office Journal* from 19th September to 31st October, 1929, include the following of agricultural interest :—

No. 62577 : Teat-cup of milking-machine ; G. Powell, jun., Orini R.D. No. 63255 : Disk plough ; F. G. Harris, Mount Bauple, Q. No. 63235 : Tractor-wheel grip ; A. M. McGregor, Parkes, N.S.W. No. 62987 : Grading eggs ; I. M. Cowan, Bondi, N.S.W. No. 63144 : Wire-fence dropper ; Corkscrew Fences, Ltd., Sydney, N.S.W. No. 63175 : Sledge ; H. J. and H. G. Sampson, Ngaruawahia. No. 63283 : Potato-grading machine ; G. J. Bevington, Rangiora. No. 63363 : Preservation of meat ; S. H. Higgs and E. P. O'Donnell, Wellington. No. 60926 : Flax-stripper ; J. E. Holland, Christchurch. No. 61460 : Wire-strainer ; N. L. de Lautour, Matawai. No. 61480 : Cream-can cover ; A. J. Squire, Kaikohe. No. 61839 : Manure-distributor ; E. I. Bullot, Waipuku. No. 60885 : Plough-raising means ; J. Henry, Loburn. No. 62386 : Hay-stacking means ; H. D. Sorensen, Paeroa. No. 63500 : Cultivating implement ; C. W. Winder, Wharepoa. No. 63566 : Fencing-standard ; W. J. S. Jones, Sydney, N.S.W.

Copies of full specifications and drawings in respect of any of the above may be obtained from the Commissioner of Patents, Wellington, price 1s. prepaid.

THE SEASON'S LAMBING: NORTH ISLAND ESTIMATE.

FROM information furnished by Inspectors of Stock in the various districts the average lambing for the current season in the North Island is estimated at 87·56 per cent., compared with 84·61 per cent. last year. With 8,820,536 breeding-ewes in the North Island, as shown in the 1929 sheep returns, the number of lambs this season is estimated at 7,723,523. South Island and Dominion estimates will appear in next month's issue of the *Journal*.

ESTIMATED AREAS UNDER CEREALS AND POTATOES.

THE following estimates of the areas under wheat, oats, and barley in the Dominion for the current season were issued by the Government Statistician at date 6th November, the figures being based on a card census: Wheat, 234,500 acres; oats, 275,000 acres; barley, 20,500 acres. The corresponding final totals for the preceding season (1928–29) were 257,873 acres of wheat, 283,133 acres of oats, and 19,840 acres of barley. Wheat, therefore, has an estimated decrease in area this season of 23,373 acres, oats a decrease of 8,133 acres, and barley an increase of 660 acres.

Also from a card census and at date 6th November the Statistician estimates this season's area under potatoes as 22,600 acres. The corresponding final figures for the 1927–28 season were 21,304 acres. Only holdings of 1 acre and over outside borough boundaries are covered by these figures; a fair aggregate area of potatoes is also grown on smaller holdings and within boroughs. Reckoned on the average of the last five seasons—5·49 tons per acre—the total yield from this season's area would be 124,000 tons, as compared with a total actual yield of 123,607 tons for 1928–29.

AGRICULTURAL SHOWS, SEASON 1929-30.

THE following show-dates have been notified by agricultural and pastoral associations:—

North Otago A. and P. Association: Oamaru, 21st and 22nd November.
Nelson A. and P. Association: Richmond, 22nd and 23rd November.
Otago A. and P. Society: Dunedin, 26th and 27th November.
Stratford A. and P. Association: Stratford, 27th and 28th November.
Southland, A. and P. Association: **Royal Show,** Invercargill, 10th, 11th, and 12th December.
Helensville A. and P. Association: Helensville, 29th January.
Opotiki A. and P. Association: Opotiki, 1st February.
Whakatane A. and P. Association: Whakatane, 5th February.
King Country A. and P. Association: Te Kuiti, 6th February.
Rodney Agricultural Society: Warkworth, 8th February.
Te Puke A. and P. Association: Te Puke, 8th February.
Dannevirke A. and P. Association: Dannevirke, 11th and 12th February.
Tauranga A. and P. Association, Tauranga, 11th and 12th February.
Masterton A. and P. Association: Solway, 18th and 19th February.
Katikati A. and P. Society: Katikati, 19th February.
Auckland A. and P. Association: Auckland, 27th February to 1st March.
Taranaki Agricultural Society: New Plymouth, 5th and 6th March.
Morrinsville A. and P. Society: Morrinsville, 12th March.
Methven A. and P. Association: Methven, 29th March.